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Williams Gateway Corridor Definition Study

working

paper #2

prepared for

Arizona Department of Transportation

prepared by

Cambridge Systematics, Inc.

December 2005

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1.0 Introduction

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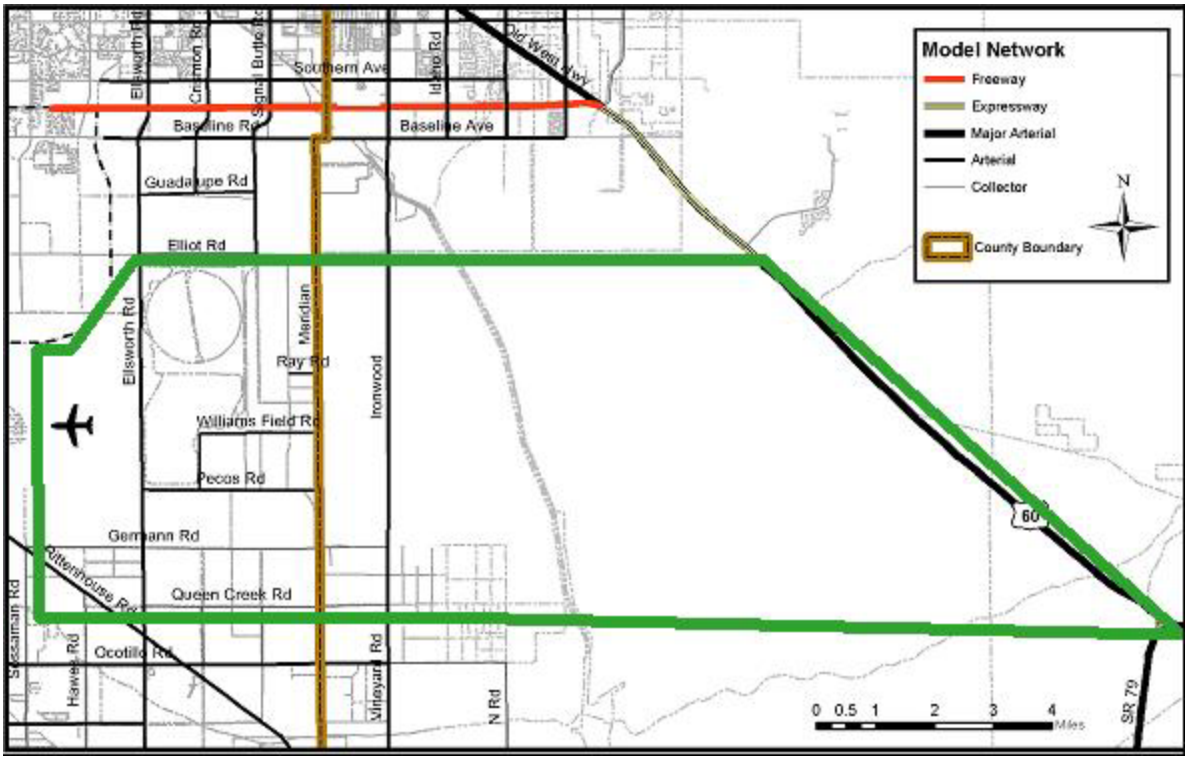
This working paper assesses the need and feasibility of a new transportation corridor for the Williams Gateway Corridor Definition Study (WGCDS). The WGCDS is one of three ongoing efforts being conducted by the Arizona Department of Transportation (ADOT) to analyze the need for new transportation corridors in the rapidly growing area of Northern Pinal County.

The WGCDS is analyzing the need for a potential corridor connecting Loop 202 (Santan Freeway) in Maricopa County to U.S. 60 in Pinal County. Figure 1.1 presents the study area for the WGCDS, bounded by Hawes Road on the west, U.S. 60 on the east, Elliot Road on the north, and Queen Creek Road on the south.

Figure 1.1 Williams Gateway Corridor Definition Study Area



Source: Cambridge Systematics, Inc., 2005.

The WGCDS is being conducted in coordination with several ongoing studies, including the following:

- ADOT is also conducting two other corridor definition studies that examine the need for three new corridors in Pinal County. These corridors are intended to address needs along U.S. 60 in the vicinity of Gold Canyon, a north-south route between Apache Junction and Coolidge, and an east-west route between I-10 and the junction of SR 79 and U.S. 60. These studies are being conducted in conjunction with the WGCDS, and detailed information on existing and future conditions is available for each study. The three studies use a joint planning model, data, and other resources. Together they are intended to provide a complete assessment of the need for future state transportation facilities in the overall study area represented by all three studies.

- The Maricopa Association of Governments (MAG) is conducting a Williams Gateway Freeway Alignment and Environmental Overview study that is focused on the portion of the Williams Gateway corridor that lies within Maricopa County. The MAG Regional Transportation Plan (RTP) identified funding for this portion of the Williams Gateway corridor to be built as part of the regional freeway system in Maricopa County. This study has identified MAG's preferred alignment for the Williams Gateway corridor within Maricopa County. Information regarding the feasibility of the corridor has been coordinated closely between these two studies.

This working paper builds on a base of information developed in the first working paper that addressed existing and future conditions in the study area, and from the first round of public involvement events conducted in March 2005. The purpose of the working paper is two-fold:

1. **To identify the need for a new transportation corridor in the study area.** This assessment is based on traffic volumes and capacity levels projected for the future (2030) transportation network in the study area. It also assesses the performance of the overall transportation system, which includes the proposed Williams Gateway corridor, other corridors identified as part of ADOT's ongoing Corridor Definition Studies, and the arterial network in the County.

2. **To determine the feasibility of developing a new corridor.** This assessment is based on potential engineering and environmental fatal flaws in the study area. It also includes an identification of major land use considerations, and an initial assessment of the costs and potential implementation strategies required to develop a new corridor.

This working paper will serve as one input into the overall planning process, which includes additional analyses, public and stakeholder input, and other information.

2.0 Needs Analysis

2.0 Needs Analysis

The needs analysis was the first step in defining a potential future Williams Gateway corridor. This section describes the methodology used to establish corridor needs and walks through the analyses that were conducted to establish that need. The end result of this process is a "corridor concept" that may be carried forward for further analysis. The corridor concept includes the results of the Williams Gateway, U.S. 60, and Pinal County Corridors studies. The section ends with a performance analysis of the overall system represented by all corridors.

2.1 Needs Analysis Methodology

A single analysis framework was implemented to maintain technical consistency between the three corridor definition studies. This framework was based around the development of a travel demand model for the joint study area represented by the three studies. The Pinal County Planning Model (PCPM) was developed using data and methods from previous modeling systems that had been developed for a portion of the study area, including the MAG model, the Pinal County model, and the Apache Junction model. Development of the socioeconomic data that drives the PCPM is described in the *Pinal County Planning Model: Socioeconomic Estimates and Forecasts* technical memorandum.

An iterative process was used to assess corridor needs in the joint study area. Initial model runs were conducted to identify corridor concepts for each of the corridors. These model runs were evaluated using demand and need criteria. Based on these evaluations, additional model runs were conducted to address additional outstanding questions. Through this process, over 20 individual model runs were conducted. A limited number of these was then evaluated at a systems level for their impact on the overall performance of the transportation system.

The remainder of the methodology section describes the initial concepts that were used to start the analysis, and the process used to evaluate the demand and need for each concept. Additional concepts are described along with the results of the analysis in the following subsection.

Initial Concepts

The initial concepts evaluated as part of the needs analysis were based on the work conducted for the first working paper, which addressed existing and future conditions. Three

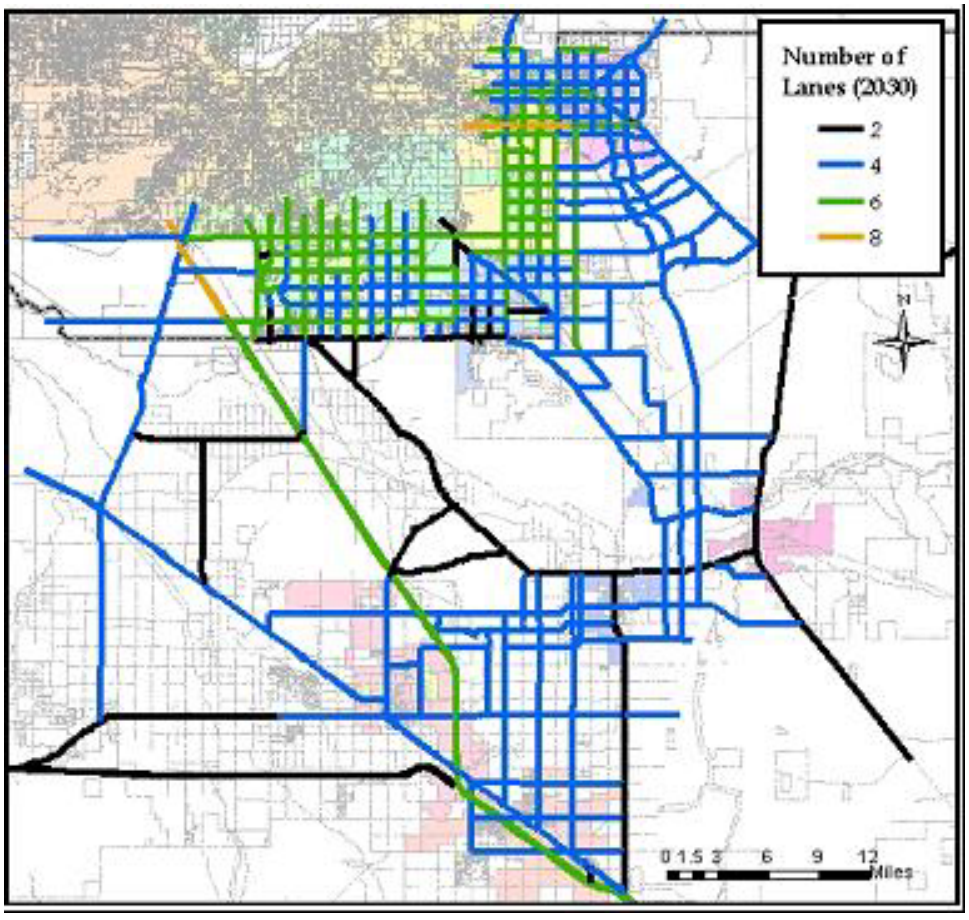
initial model runs were conducted to generate a starting point for the analysis of corridor needs. These initial runs, described in detail here, were the base future, enhanced future, and SEMNPTS corridors.

Base Future

The Base Future concept serves as the comparison point for all modeling and analysis. This concept identifies the expected transportation investments in the study area, except for any corridor investment. The 2030 network for this concept includes the following elements (Figure 2.1):

- All planned or programmed investments in Maricopa and Pinal Counties;
- Development of an arterial system through State Trust Lands;
- Widening of arterials to four lanes throughout Pinal County;
- Improvements in Maricopa County based on the MAG RTP; and
- No change to the existing state highway system, except for widening I-10 to six lanes.

Figure 2.1 Base Future Concept Transportation Network

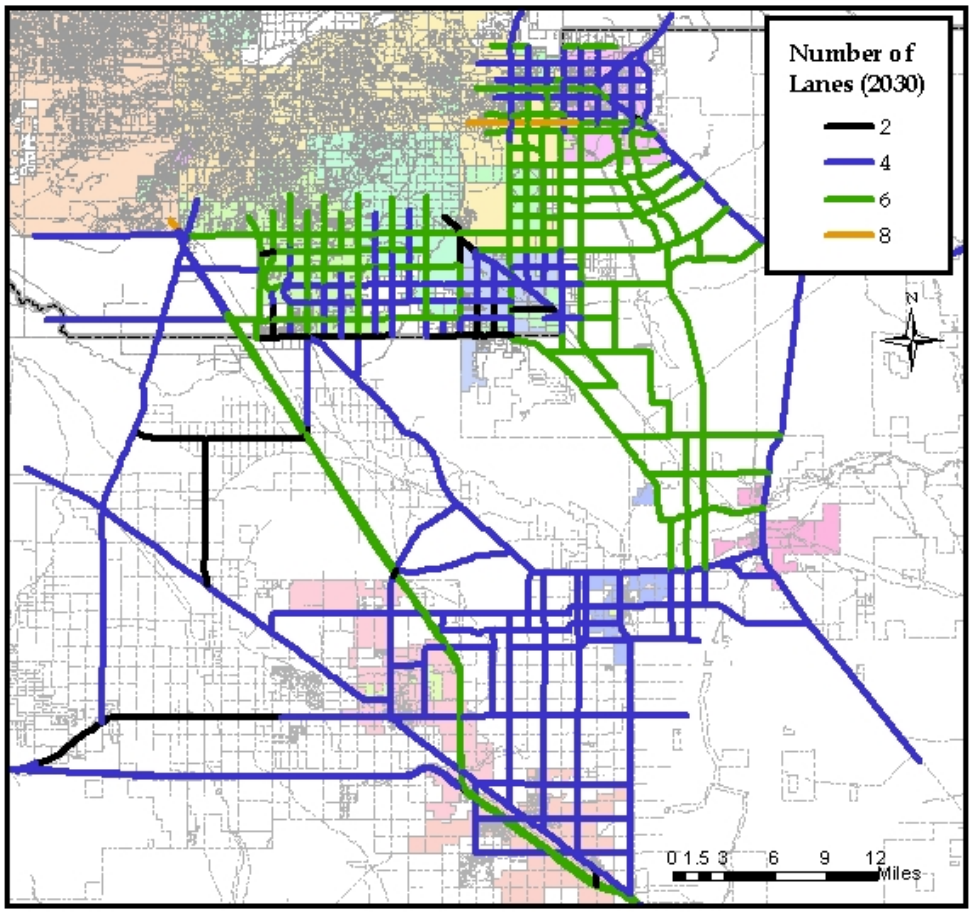


Enhanced Future

The enhanced future concept was developed to explore the impact of additional local and regional investment in the arterial network. This concept will help ADOT determine the extent to which travel in the study area is local or regional in nature. The basic elements of this concept, shown in Figure 2.2, include:

- Widening the future arterial network in Pinal County from four to six lanes north of SR 287;
- No change to the arterial network in Pinal County south of SR 287;
- Widening the non-interstate state highway network from two to four lanes; and
- No change to the improvements identified in the MAG RTP.

Figure 2.2 Enhanced Future Transportation Network



Corridor Concepts

Several concepts were analyzed to make a determination of the need for new corridors in the study area. These analyses started from the corridors that were identified as part of the Southeast Maricopa/Northern Pinal County Transportation System (SEMNPTS) study. The SEMNPTS study identified the following new four-lane corridors (Figure 2.3):

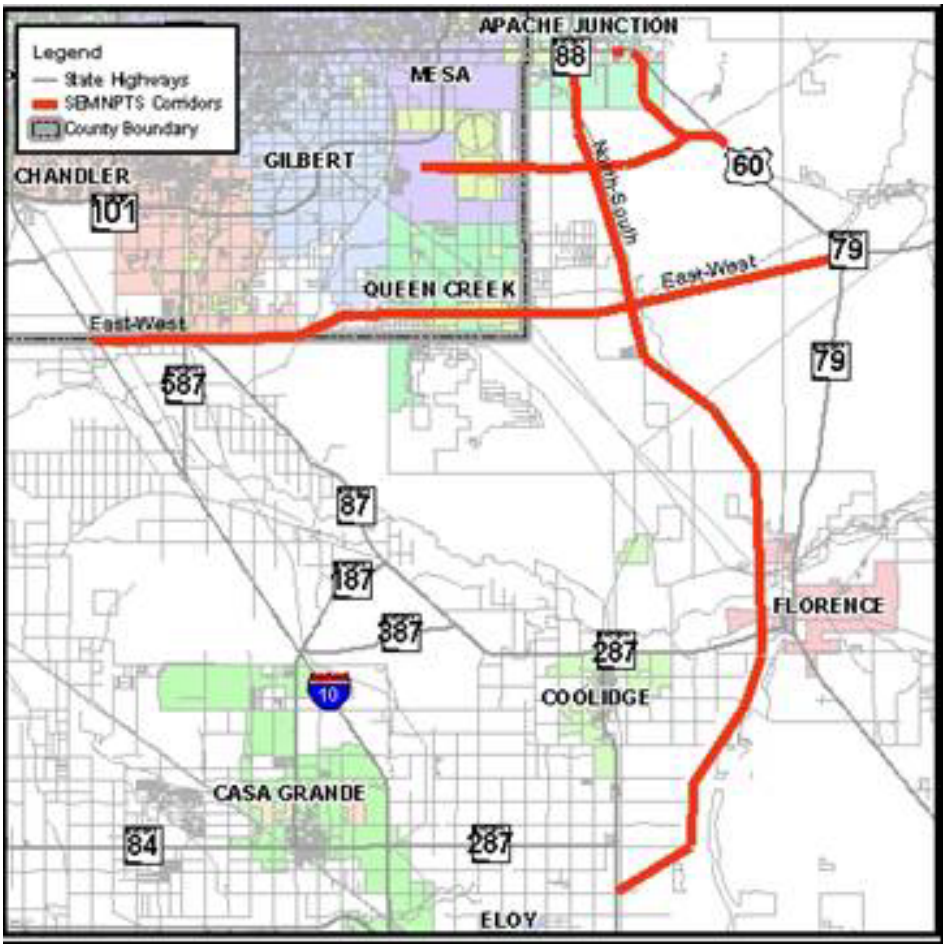
1. A Williams Gateway corridor that connected Loop 202 in the vicinity of the Hawes interchange south and then east to U.S. 60 in the vicinity of the Renaissance Fair;

2. A U.S. 60 reroute that would extend the freeway portion of U.S. 60 from its current terminus to the vicinity of the Renaissance Fair;

3. A North-South corridor that connected Apache Junction and Coolidge; and

4. An east-west corridor that connected I-10 to Florence Junction running in the vicinity of Hunt Highway.

Figure 2.3 SEMNPTS Study Recommended Corridors



Needs Assessment Methodology

This configuration of roadways provided the first corridor model run. Based on this and the information generated for the base future and enhanced future runs, an initial assessment of needs was generated and additional concepts were created. The detailed analysis of the three starting concepts and these additional concepts is provided below.

Each of the concepts identified through the needs analysis was evaluated based on the demand for use of the proposed facility and the capacity of both the proposed facility and the arterial network. A corridor is considered needed if there is sufficient demand for the corridor, and if it helps relieve potential capacity constraints on the transportation system. The analyses of demand and capacity are provided at the corridor level. Fundamentally, they answer the following questions:

- Is there enough demand on a proposed new facility to warrant future development?
- If there is sufficient demand, what are the appropriate functional class and number of lanes to accommodate the demand for that facility?
- How does the proposed corridor impact the ability of the arterial system to handle demand?

The means of measuring each of these two concepts – demand and capacity – is explained in more detail.

Capacity

Table 2.1 presents the typical capacity assumed for the various functional classes of roadways present in the study area: collectors, arterials, expressways, and freeways.[1] Although actual capacities vary based on numerous considerations – number of access points, control devices (signals or stops), and others – the figures in Table 2.1 present conditions for a typical roadway segment in the study area.

The table provides estimates of total daily capacity by functional class and number of lanes. This total capacity represents the maximum traffic flow that can be handled by this facility. If traffic flows exceed the capacity, the corridor is considered congested and traffic will be at a stand still during peak hours. Even if traffic volumes approach the capacity, travel on the facility will be far below free-flow speeds during the peak period.

[1] The WGCDS is primarily concerned with freeways (U.S. 60 west of Mile Post 198 and the proposed corridors) and arterials. The existing U.S. 60 east of Mile Post 198 is the only expressway in the corridor, and all of the major streets are projected to be arterials and not collectors.

Table 2.1 Typical Corridor Capacity by Functional Class

Roadway Functional Class	Typical Lane Capacity (Vehicles Per Day)	Number of Lanes (Both Directions)	Typical Total Capacity (Vehicles Per Day)
Collector	8,000	2	16,000
Arterial	8,800	4	35,200
		6	52,800
Expressway	9,900	4	39,600
Freeway	24,300	4	97,200
		6	145,800

Source: Cambridge Systematics, Inc., and Lima & Associates, 2005.

ADOT uses the concept of level of service (LOS) to measure the extent to which a roadway has sufficient capacity to carry the projected volumes. Roadways receive a LOS grade from A to F, with A representing free-flow conditions and F representing complete grid-lock. The letter grades are based on a ratio of the number of vehicles using the road to the capacity of the road (the volume-to-capacity (V/C) ratio). Table 2.2 presents the three capacity levels (sufficient capacity, nearing capacity, and above capacity) that were used to evaluate the capacity of the roadway. The analysis assumes, in short, that if the volume on the roadway is greater than 80 percent of the capacity, there may be future capacity problems to be addressed (nearing capacity). If the volume exceeds the capacity, the system will not function appropriately.

Table 2.2 Capacity and Level of Service Grades

Capacity Level	LOS Grades	Range of V/C Ratio
Sufficient Capacity	A, B, and C	0.0 to 0.80
Nearing Capacity	D and E	0.81 to 1.00
Above Capacity	F	Greater than 1.00

Source: Arizona Department of Transportation.

The evaluation of capacity and level of service was conducted for both the newly proposed corridors and the arterial system. The intent of identifying new corridors is to develop an overall road system that provides for both local and interregional trips. The local trips should be handled by the local arterial network. If a new corridor is helping to solve a local transportation issue, it may not be appropriate as a future state highway.

However, the new corridors should provide relief to the local arterial system by transferring longer-distance trips that may be using the local system in the absence of sufficient capacity on the state highway system.

Demand

In addition to evaluating the level of service of the corridors and arterial network, the needs analysis also includes an evaluation of the demand for the proposed corridors. This assessment was based on the volume of vehicles expected to use the corridors in 2030. For each concept evaluated, demand estimates were generated using the PCPM and compared to thresholds of minimum demand that the type of facility is expected to carry.

Table 2.3 presents the threshold guides that were used to evaluate the scenarios. These thresholds are not hard and fast rules, but are guidelines that help to identify roadways that fall below (or above) the demand appropriate for a particular facility. The maximum thresholds are based on the capacity of the roadway (from Table 2.1 above). The minimum thresholds are based on the ability of a roadway of lower functional class or with fewer lanes to handle the expected volume in 2030.

Table 2.3 Demand Threshold Guidelines

Roadway Functional Class	Number of Lanes (Both Directions)	Minimum Demand (Vehicles Per Day)	Maximum Demand (Vehicles Per Day)
Collector	2	n/a	16,000
Arterial	4	12,000	35,200
	6	25,000	52,800
Expressway	4	25,000	39,600
Freeway	4	50,000	97,200
	6	**80,000**	**145,800**

Source: Cambridge Systematics, Inc., 2005.

2.2 Needs Analysis

As described above, the needs analysis began with the evaluation of three key scenarios: base future, enhanced future, and all corridors. This section first describes these initial

starting points as they relate to the Williams Gateway corridor and then walks through additional corridor concepts that were defined and evaluated.

Starting Point for Needs Analyses

As described above, three concepts were evaluated to develop a starting point for assessing corridor needs in the study area: base future, enhanced future, and recommended corridors from the SEMNPTS study. These results are described here.

Base Future

This scenario represents the expected future transportation system as described in Section 2.1 and in *Working Paper #1: Existing and Future Conditions*. The concept includes assumptions about the arterial network needed to support expected future development in the study area. The base future scenario assumes that a Williams Gateway freeway will be built within Maricopa County. This facility is funded as part of the MAG RTP, which was approved by voters as part of a one-half-cent sales tax extension in 2004.

In the Base Future concept, most arterials west of Ironwood are six lanes, and most arterials east of Ironwood are four lanes. Arterials in the WGCDS study area are heavily traveled, often carrying over 30,000 vehicles a day (Figure 2.4). Several four-lane arterials carry upwards of 40,000 vehicles per day. East of Meridian Road, most east-west arterials are either near or over capacity, including Elliott, Ray, Warner, Williams Field, and Germann Roads. Most north-south arterials east of Meridian Road are also near or over capacity. Table 2.4 presents the traffic volumes and level of capacity at key locations in the WGCDS study area. Under the base future scenario, all 10 locations are expected to operate at a level of service that is nearing or over capacity, and seven are expected to be over capacity.

Figure 2.4 Future Base Volumes and Level of Capacity

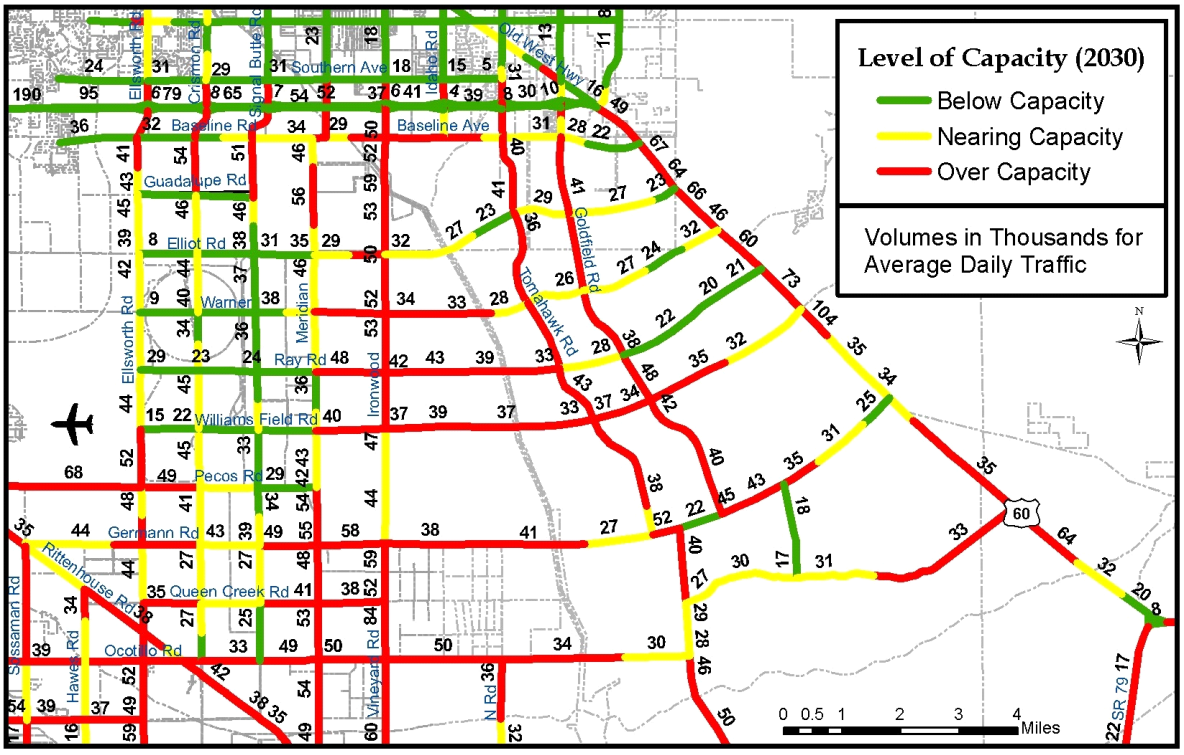


Table 2.4 Future Base Traffic Volumes and Level of Service at Key Locations

Road	Cross Street	Projected Average Daily Volume	Level of Capacity
Ironwood	Germann	51,500	Over
	Ray	53,000	Over
Ellsworth	Germann	46,900	Nearing
	Ray	45,500	Nearing
Tomahawk	Germann	38,000	Over
	Ray	43,000	Over
Elliot	Ironwood	33,000	Over
	Tomahawk	29,000	Nearing
Germann	Ironwood	47,800	Over
	Tomahawk	52,000	Over

Enhanced Future

As described in Section 2.1, the enhanced future scenario evaluates the impact of widening most of the arterials in Northern Pinal County to six lanes. This significantly impacts the WGCDS study area, which is only expected to develop four-lane arterials for most roadways by 2030. This scenario also assumes that existing state highways in Pinal County will be widened to four lanes. In the WGCDS study area, there are no existing two-lane state highways, but an increase in highway capacity outside of the immediate study area can also impact the flow of traffic through the area. Several state highways in Pinal County just outside the study are (e.g., SR 79) are currently two lanes.

Adding lanes to the arterial network in the WGCDS study area shifts volumes across the east-west and north-south arterials to help relieve some of the roadway congestion in 2030 (Figure 2.5). Notably, most of the east-west arterials now operate below capacity. Demand volumes for these east-west roads are fairly consistent to the base year, but have shifted somewhat to take advantage of the additional capacity. The additional capacity allows some trips to take more direct routes to their final destinations, reducing the volumes traveled on some of the arterials in the study area (Table 2.5).

Figure 2.5 Enhanced Future Volumes and Level of Capacity

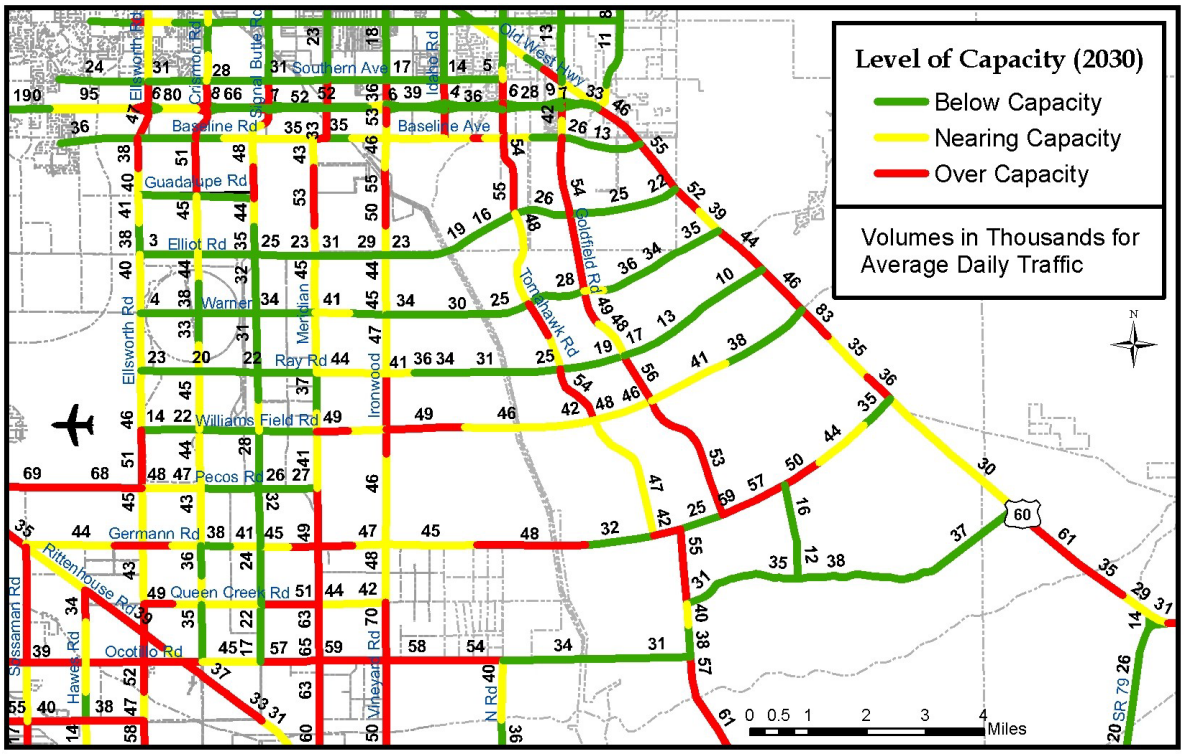


Table 2.5 Enhanced Future Traffic Volumes and Level of Service at Key Locations

		Base Future		Enhanced Future	
Road	Cross Street	Projected Average Daily Volume	Level of Capacity	Projected Average Daily Volume	Level of Capacity
Ironwood	Germann	51,500	Over	25,500	Below
	Ray	53,000	Over	21,500	Below
Ellsworth	Germann	46,900	Nearing	42,000	Nearing
	Ray	45,500	Nearing	42,000	Nearing
Tomahawk	Germann	38,000	Over	27,000	Nearing
	Ray	43,000	Over	9,000	Below
Elliot	Ironwood	33,000	Over	26,500	Nearing
	Tomahawk	29,000	Nearing	12,500	Below
Germann	Ironwood	47,800	Over	37,000	Nearing
	Tomahawk	52,000	Over	20,000	Below

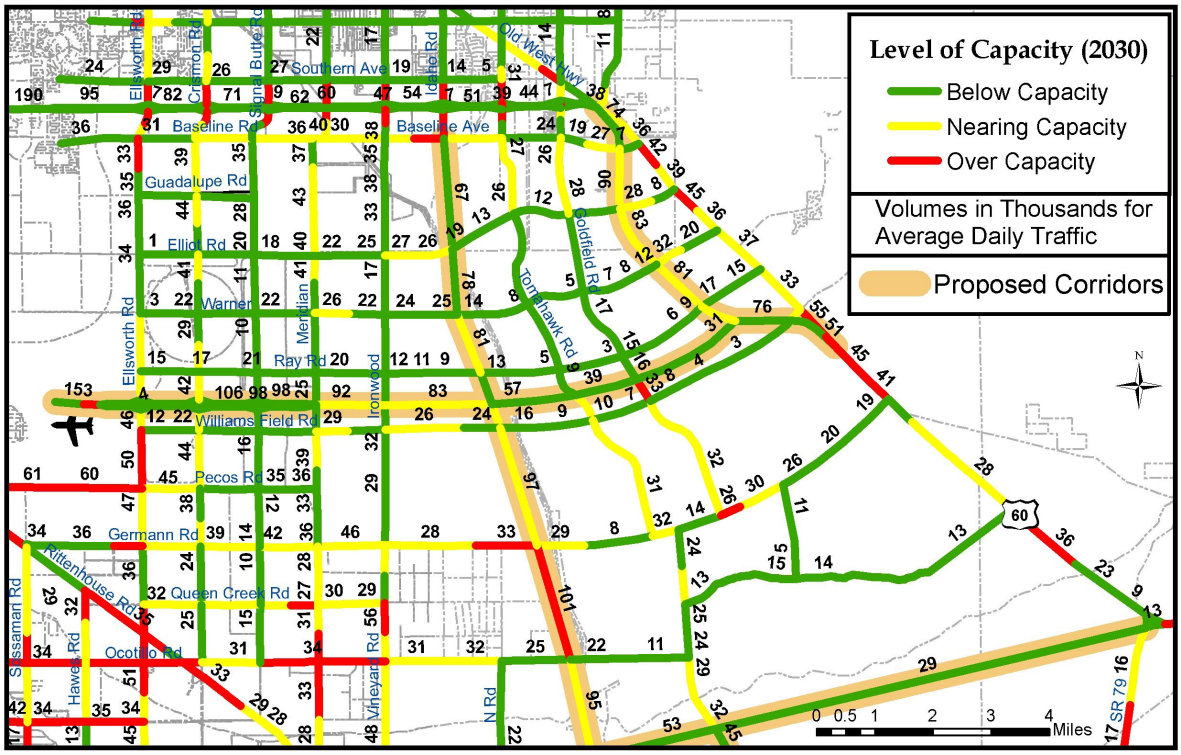
Several north-south arterials, however, continue to show congestion with additional capacity. In particular, Ironwood, Goldfield, and Tomahawk Roads have several segments that are nearing or over capacity in this scenario. This suggests that this scenario is not meeting the demand for north-south travel in the study area.

All Corridors (SEMNTPS) Concept

The final analysis that formed the starting point of the needs estimation process was of all four corridors identified in the SEMNPTS. This joint study between MAG, the Central Arizona Association of Governments (CAAG), and ADOT identified four new corridors as four-lane freeways in Pinal County (Figure 2.3).

Figure 2.6 presents the traffic volumes and level of capacity for the SEMNTPS corridors within the WGCDS study area. The SEMNPTS corridors provide a major improvement to the level of capacity throughout the study area. Almost all of the corridor segments and arterial streets in the study area would operate below capacity in this concept.

Figure 2.6 SEMNTPS Future Volumes and Level of Capacity



Traffic volumes along the Williams Gateway corridor range from under 30,000 near the junction with U.S. 60 to over 80,000 just west of the intersection, and with the North-South corridor to well over 100,000 within Maricopa County. Within the Williams Gateway corridor, the segments east of the North-South corridor are generally below the level appropriate for a freeway facility (as identified in Table 2.3 above).

The Williams Gateway corridor has a substantial impact on the local arterial network. Table 2.6 presents the traffic volumes and level of capacity for key locations. Between the North-South corridor and the U.S. 60 corridor, the Williams Gateway corridor captures nearly all of the movements from the arterial system. Many of the arterial segments along Warner, Ray, Williams Field, and other east-west arterials have fewer than 10,000 vehicles a day. This is far below the threshold identified in Table 2.3. All of these segments are operating well below their capacity constraints.

West of the North-South corridor, many of the arterials continue to have relatively substantial volumes (upwards of 20,000 vehicles per day), but all arterials operate below capacity. Most of the north-south arterials in the study area continue to show volumes that meet the guidelines for a four-lane arterial, though much of the traffic has shifted from these arterials to the north-south and U.S. 60 corridors.

Table 2.6 SEMNPTS Traffic Volumes and Level of Service at Key Locations

		Base Future		SEMNPTS	
Road	**Cross Street**	**Projected Average Daily Volume**	**Level of Capacity**	**Projected Average Daily Volume**	**Level of Capacity**
Ironwood	Germann	51,500	Over	47,000	Nearing
	Ray	53,000	Over	48,000	Nearing
Ellsworth	Germann	46,900	Nearing	45,500	Nearing
	Ray	45,500	Nearing	44,500	Nearing
Tomahawk	Germann	38,000	Over	42,000	Nearing
	Ray	43,000	Over	51,000	Over
Elliot	Ironwood	33,000	Over	26,000	Below
	Tomahawk	29,000	Nearing	21,000	Below
Germann	Ironwood	47,800	Over	46,000	Nearing
	Tomahawk	52,000	Over	50,000	Nearing

Corridor Concepts

The next step in the needs analysis process involved refinements to the corridors and development of a corridor concept. Refinements to the corridor concept were based on two key findings from the first set of model runs:

1. There is a clear need for additional capacity in the study area. Both east-west and north-south movements appear congested in the base future. Adding arterial capacity provides some benefits, but not as substantial as adding new corridors.

2. East of the North-South corridor, a four-lane Williams Gateway freeway creates substantial excess capacity. With a new freeway corridor, many of the arterials in this area have volumes well below the level appropriate for an arterial.

Based on these findings, the SEMNPTS corridor concepts were refined and additional analyses were conducted. This section describes four additional concepts that were evaluated for the WGCDS:

1. **Refined All Corridors**. The draft corridors presented in the SEMNPTS study were refined based on the analyses above. These refined corridors are the second step in identifying a set of corridors that are needed. All four corridors are represented in this step, though in different configurations than originally identified in SEMNPTS.

2. **Williams Gateway Corridor**. To validate the findings from the All Corridors (SEMNPTS) and Refined All Corridors concepts, a separate model run was conducted with the Williams Gateway corridor only, coded as a four-lane freeway. This model run does not include the other corridors.

3. **Corridor Concept**. Based on the results of the Refined All Corridors analysis, a Corridor Concept was developed, which was refined over several separate model runs and analyses. Only the final Corridor Concept is presented here.

4. **Corridor Concept Plus**. This concept combines the Corridor Concept analysis with aspects of the Enhanced Future analysis. In particular, it includes widening of existing state highways in Pinal County to four-lane access controlled facilities.

Each of these steps in the needs analysis process is described below.

Refined All Corridors Concept

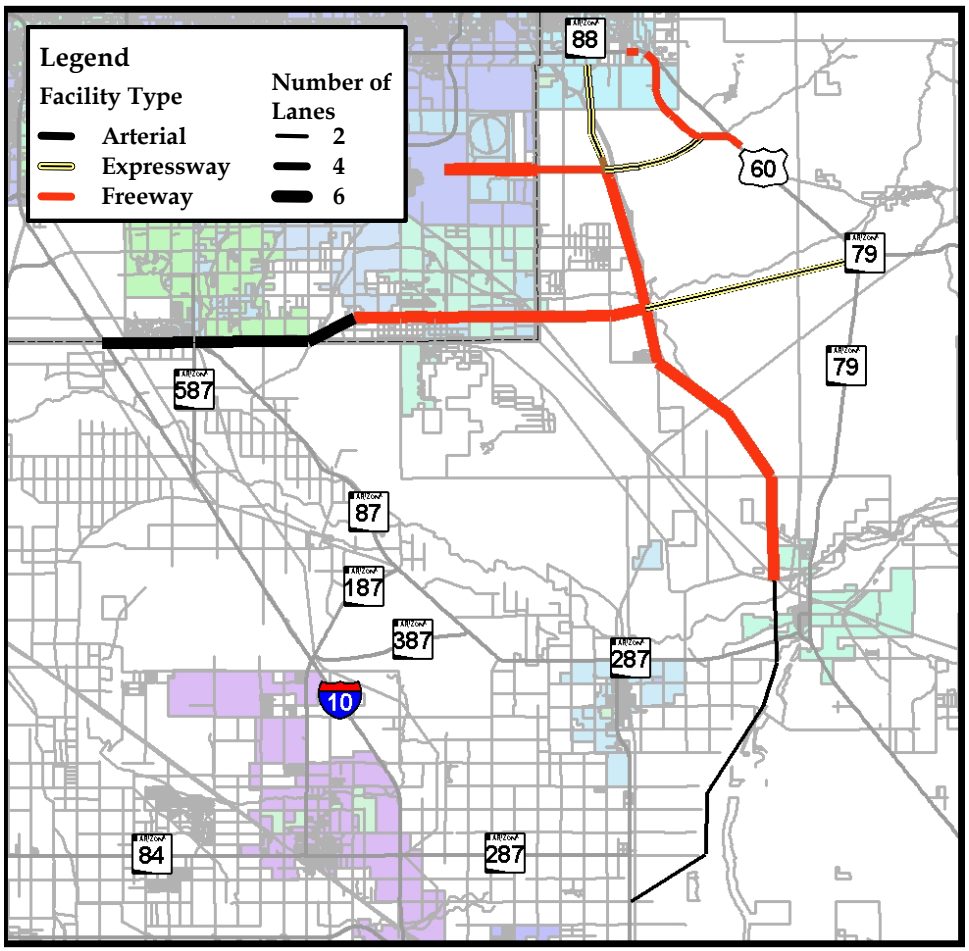
This concept was based on an assessment of the three model runs described above. A starting point for each of the corridors was selected to help identify the maximum level of corridor development needed to support demand in the joint study area for all three corridor definition studies. Table 2.7 provides specific facility type and number of lanes for the Williams Gateway corridor. Figure 2.7 presents the facility type (arterial, expressway, or freeway) and number of lanes identified for each of corridors.

Table 2.7 Refined Initial Concept – Williams Gateway Corridor

Segment	Description	Facility Level	Lanes
1	Loop 202 to Meridian Road	Access controlled (freeway)	6
2	Meridian Road to North-South corridor	Access controlled (freeway)	4
3	North-south corridor to U.S. 60	Limited access (expressway)	4

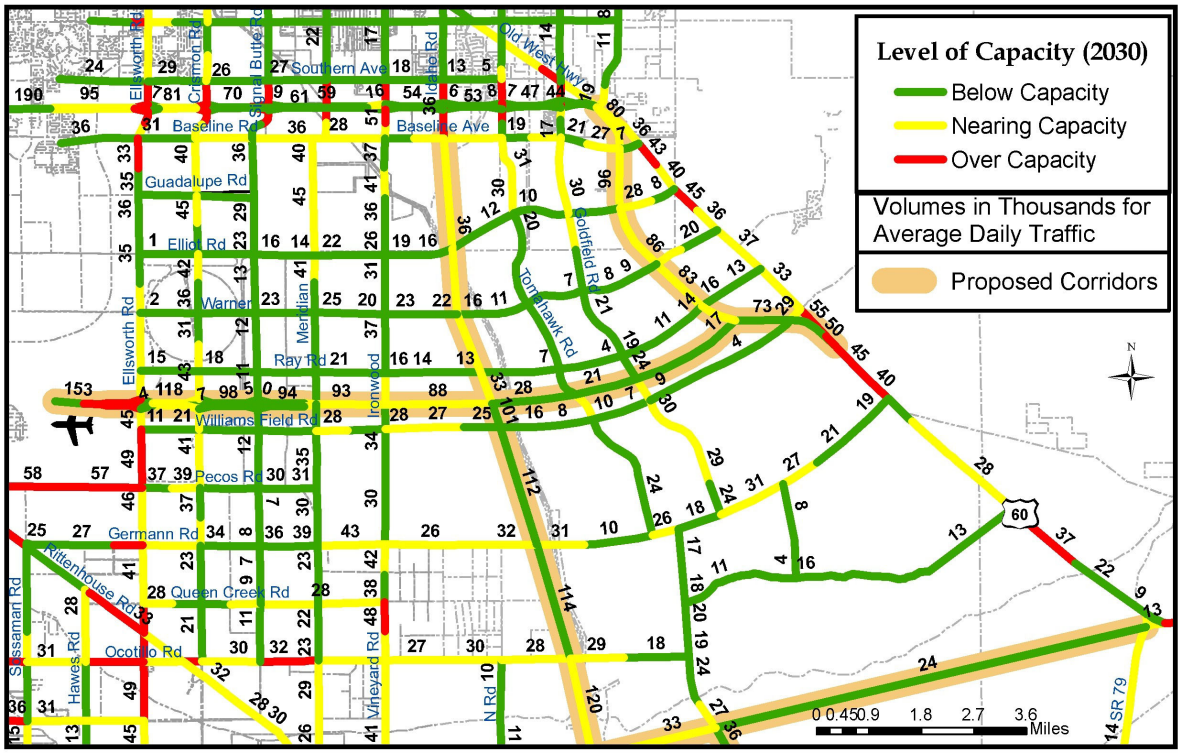
Source: Cambridge Systematics, Inc.

Figure 2.7 Refined All Corridors Concept



The Refined All Corridors concept provides the same basic benefits, in terms of demand and needs, as the SEMNPTS concept (Figure 2.8). As with the SEMNTPS concept, much of the traffic along north-south arterials is diverted to either the proposed U.S. 60 corridor or the proposed North-South corridor. Similarly, much of the east-west arterial traffic shifts to the proposed Williams Gateway corridor. In the Williams Gateway corridor area, nearly all congestion on arterials in the base future is alleviated in both east-west and north-south directions. Most of the arterials in the WGCDS study area are below capacity, and the most of the remaining are nearing capacity. Table 2.8 presents the traffic volumes and level of service calculations at several key locations.

Figure 2.8 Refined All Corridors Future Volumes and Level of Capacity



Even as an arterial, the Williams Gateway corridor creates excess capacity in the eastern portion of the WGCDS study area. Elliot, Warner, Ray, and Williams Field Roads all have segments with fewer than 10,000 vehicles per day east of the North-South corridor. The additional capacity in the Williams Gateway corridor does not appear to be needed.

By contrast, west of the North-South corridor, there is a clear demonstrated need for additional freeway capacity in the Williams Gateway corridor. These segments handle between 88,000 and over 150,000 vehicles per day. In conjunction with the North-South corridor, they show a clear pattern of travel from the southeast to the northwest.

Table 2.8 Refined All Corridors Concept Traffic Volumes and Level of Service at Key Locations

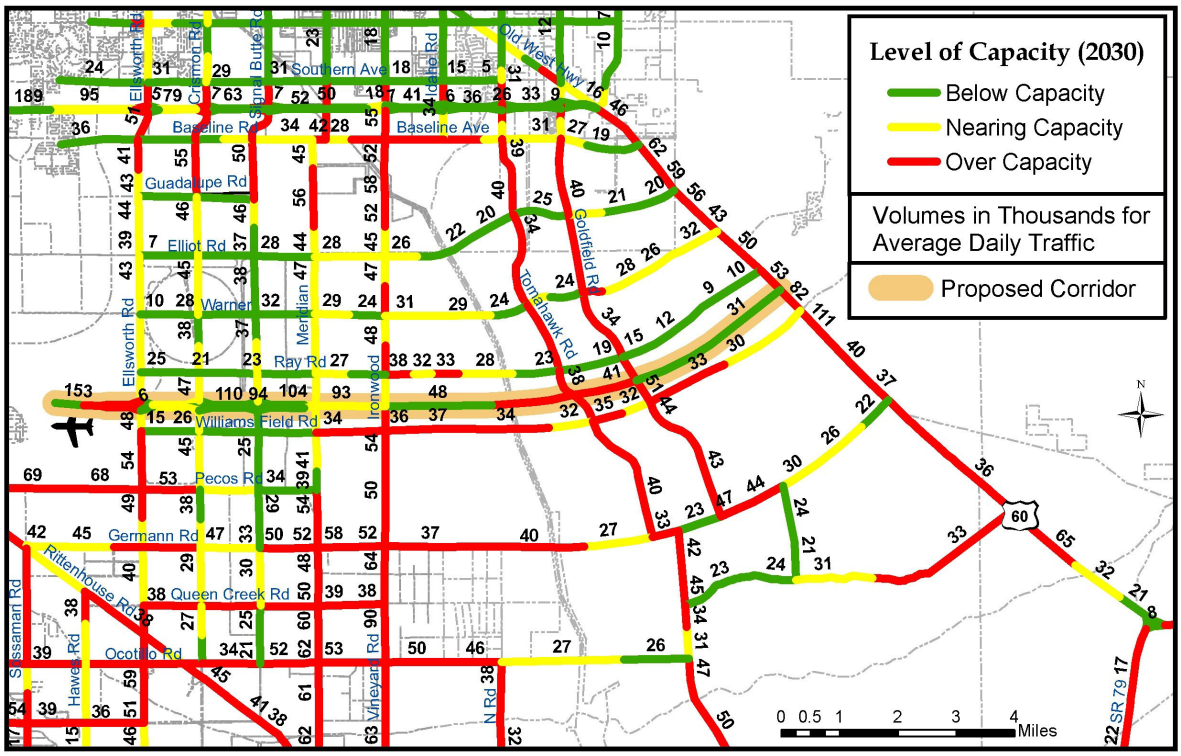
		Base Future		Refined All Corridors	
Road	Cross Street	Projected Average Daily Volume	Level of Capacity	Projected Average Daily Volume	Level of Capacity
Ironwood	Germann	51,500	Over	36,000	Below
	Ray	53,000	Over	37,000	Nearing
Ellsworth	Germann	46,900	Nearing	44,000	Nearing
	Ray	45,500	Nearing	40,500	Nearing
Tomahawk	Germann	38,000	Over	19,000	Below
	Ray	43,000	Over	16,000	Below
Elliot	Ironwood	33,000	Over	22,000	Below
	Tomahawk	29,000	Nearing	10,000	Below
Germann	Ironwood	47,800	Over	34,500	Nearing
	Tomahawk	52,000	Over	18,000	Below

Williams Gateway Corridor Only

In addition to the corridors evaluated as part of the overall system, an individual evaluation was also generated for the Williams Gateway corridor alone. The corridor modeled in this concept was the same as that modeled in the Refined All Corridors, but excludes the other corridors (U.S. 60, north-south, and east-west). This evaluation helps clarify the potential role of the Williams Gateway corridor, in particular of the segment east of the proposed North-South corridor.

Demand for the Williams Gateway corridor by itself is lower than the Refined All Corridors concept (Figure 2.9). On the segment between Ironwood and Tomahawk Roads, the demand in this scenario is one-half of what was in the Refined All Corridors. Without additional capacity along U.S. 60, however, there is somewhat a greater demand along the Williams Gateway corridor east of Tomahawk Road, and along other arterials that parallel the Williams Gateway corridor in this area.

Figure 2.9 Williams Gateway Only Future Volumes and Level of Capacity



Overall, the Williams Gateway corridor by itself provides few of the benefits that the Refined All Corridors concept provided. Substantial congestion remains along the key north-south arterials, with Ironwood, Tomahawk, and Goldfield showing predicted volumes that exceed roadway capacities. In the east-west direction, several of the arterials are now nearing or over capacity. Volumes on the Williams Gateway corridor itself drop off substantially from the Refined All Corridors, suggesting that this concept is less functional to the overall system than the Refined All Corridors concept.

Again, the key finding from this analysis is that a Williams Gateway corridor east of the proposed North-South corridor does not appear to be needed. By itself, this corridor does not solve the traffic congestion present in the study area. Even alone, several segments of the Williams Gateway corridor operate well below capacity.

Corridor Concept

The next step in the analysis was an evaluation of the key corridors carrying substantial volumes and providing sufficient capacity from the Refined All Corridors concept. This is referred to as the Corridor Concept. The combined analysis of the concepts evaluated so far suggests a clear pattern of travel movements from the southeast to the northwest

within the study area. Traffic from the study area uses two primary paths for long-distance trips:

1. A combined North-South and Williams Gateway corridor; and
2. A reroute of U.S. 60.

Both of these corridors were evaluated as six-lane freeways. In addition, the segment of the North-South corridor that is north of the Williams Gateway corridor was evaluated as a four lane facility with limited access (e.g., few or now driveways and stop lights only at major intersections, such as a local parkway or expressway).

The corridor concept shows roughly the same benefits as the Refined All Corridors concept (Figure 2.10). Again, substantial volumes on north-south and east-west arterials in the Base Future concept shift to the North-South, U.S. 60, and Williams Gateway corridors. The level of service of arterials within the WGCDS study area also improves markedly. Most east-west and north-south arterials are below capacity, with several segments nearing capacity. The corridors themselves operate within or close to their capacity limits as well, except for a small segment of the Williams Gateway near the Williams Gateway airport and one segment of the North-South corridor between Germann and Ocotillo that are slightly over capacity.

Figure 2.10 Corridor Concept Future Volumes and Level of Capacity

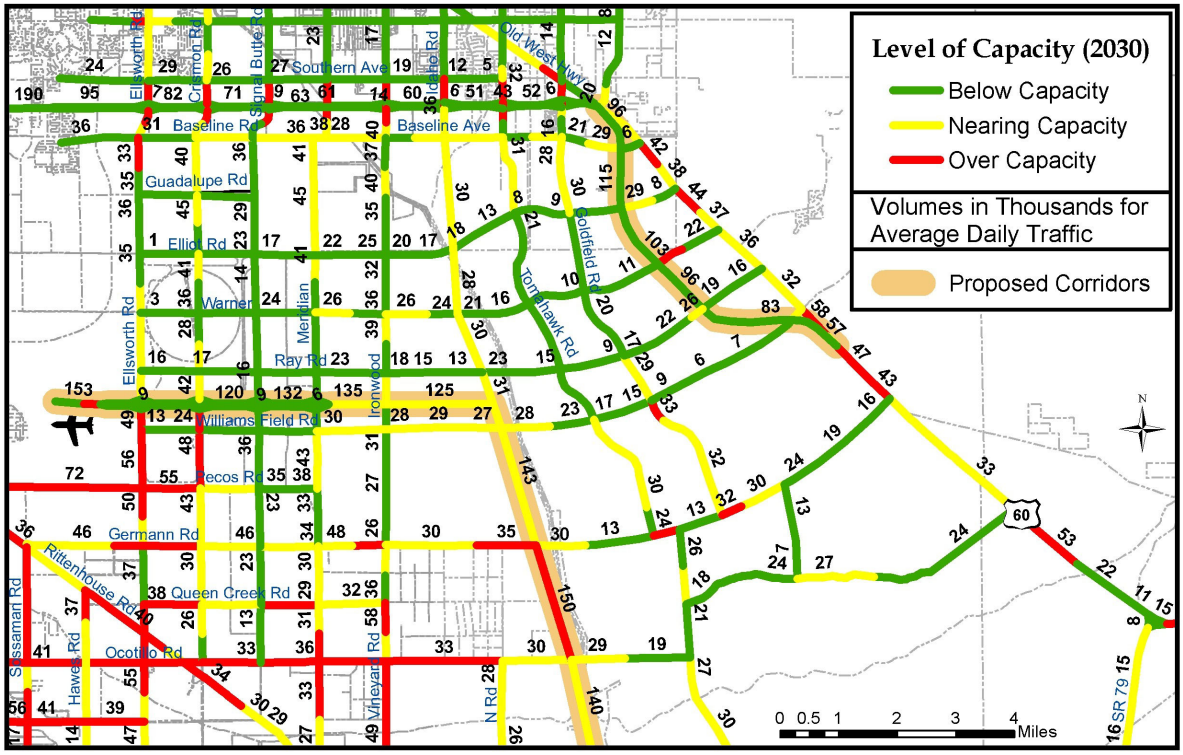


Table 2.9 presents a comparison of traffic volumes and level of capacity for the Base Future and the Corridor Concept at key locations in the WGCDS study area. Notably, even without a Williams Gateway corridor east of the North-South corridor, all of the east-west arterials in this area are well below the 35,000 vehicles per day that can be accommodated on a four-lane arterial. These arterials handle slightly greater volumes than in the Refined All Corridors concept, but all have substantial capacity available. Several segments still show fewer than 10,000 vehicles per day, though most are predicted to have 15,000 to 25,000 vehicles per day.

Table 2.9 Corridor Concept Traffic Volumes and Level of Service at Key Locations

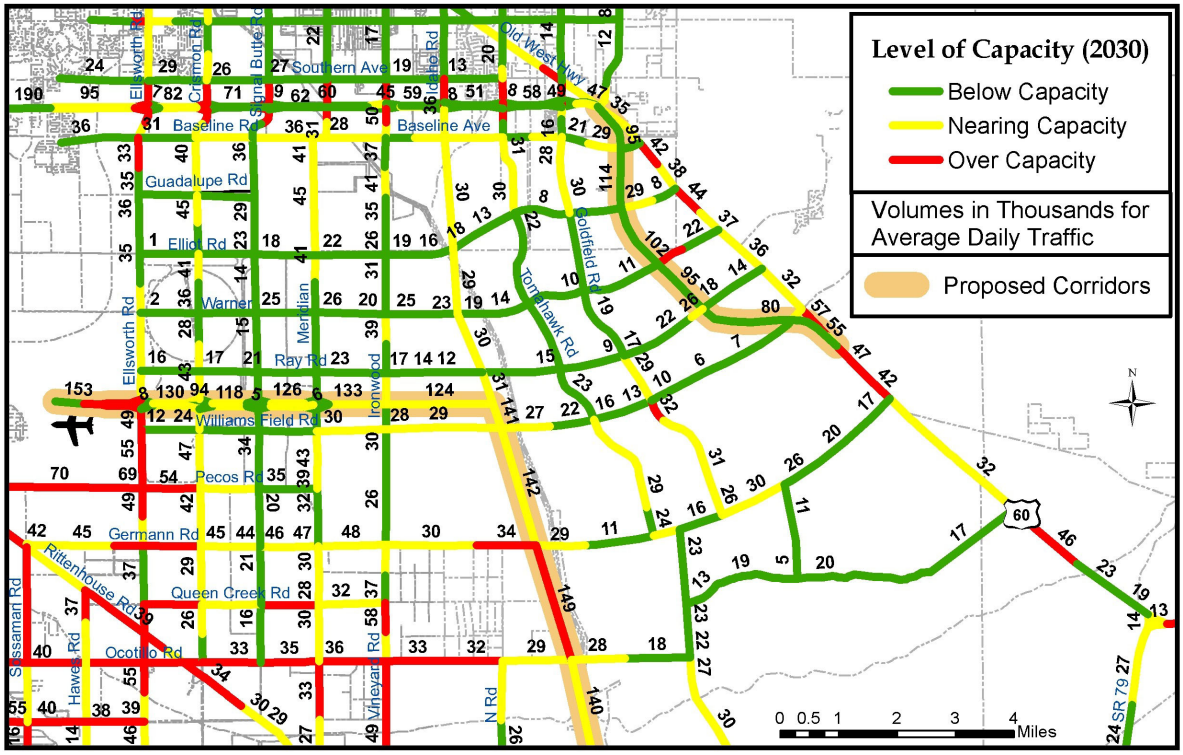
		Base Future		SEMNPTS	
Road	Cross Street	Projected Average Daily Volume	Level of Capacity	Projected Average Daily Volume	Level of Capacity
Ironwood	Germann	51,500	Over	37,000	Below
	Ray	53,000	Over	39,000	Nearing
Ellsworth	Germann	46,900	Nearing	42,500	Nearing
	Ray	45,500	Nearing	63,500	Nearing
Tomahawk	Germann	38,000	Over	24,000	Below
	Ray	43,000	Over	22,000	Below
Elliot	Ironwood	33,000	Over	22,500	Below
	Tomahawk	29,000	Nearing	10,500	Below
Germann	Ironwood	47,800	Over	39,000	Nearing
	Tomahawk	52,000	Over	22,500	Below

Corridor Concept Plus

The final evaluation step was the Corridor Concept Plus. This scenario is based on the corridor concept, but includes widening the existing state highway system in Pinal County to four lanes, when and where needed. In the WGCDS study area, all of the existing state highways are already four lanes. However, improvements elsewhere in Pinal County may have an impact on the study area. For example, widening of SR 87 through the Gila River Indian Community or SR 79 up to Florence Junction may impact the routes used to commute from Florence and Coolidge into the Phoenix metro area.

The findings for this scenario are similar to the Corridor Concept (Figure 2.11). A few additional arterials operate below capacity in the Corridor Concept Plus, but there are few major differences from the Corridor Concept.

Figure 2.11 Corridor Concept Plus Future Volumes and Level of Capacity



2.3 System Performance Analysis

In addition to the analysis of demand and capacity of individual corridors and arterials, the needs analysis includes an assessment of the system performance of each of the key concepts evaluated. A complete analysis of system performance can be found in the *Corridor Definition Study Performance Analysis Technical Memorandum*. This section summarizes the performance analysis and provides some detailed information on the WGCDS study area. The results discussed in this section are used to support the overall analysis of corridor alternatives for the Williams Gateway corridor.

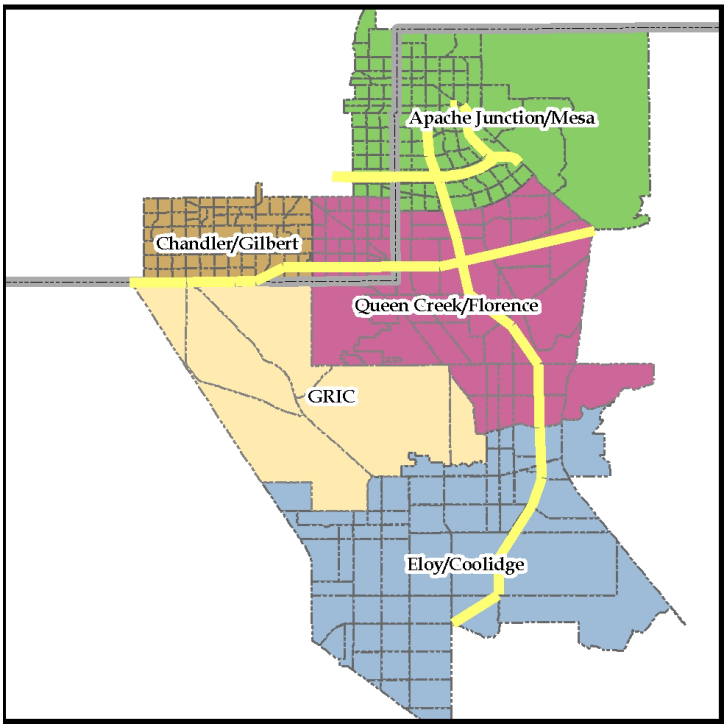
The concepts were evaluated using a common set of performance measures that are linked to key planning factors established by ADOT as part of the State Long-Range Transportation Plan (MoveAZ). The five factors evaluated and the performance measures used as part of this process are presented in Table 2.10.

Table 2.10 System Performance Factors and Measures

MoveAZ Planning Factor	Performance Measures
Mobility	• Vehicle miles of travel (VMT) • Vehicle hours of travel (VHT) • Percent of network that is congested
Safety	• Crash rate (fatality, injury, property damage only (PDO))
Accessibility	• Access to existing employment centers
Resource conservation	• Fuel consumption • Emissions (CO_2, NO_x, and HC)
Resource conservation/accessibility	• Environmental justice

The performance analyses were conducted at several levels. The primary level was for the overall transportation system. This system-level analysis included the joint study area for the three corridor definition studies. In addition, the performance evaluation was calculated for each of five separate subareas that represent key divisions in the overall study area (Figure 2.12). The Williams Gateway corridor is included in the Apache Junction/ Mesa subarea, and the evaluations discussed here focus on this subarea.

Figure 2.12 Subareas for Corridor Performance Measure Evaluation



Performance Evaluation Results

This section describes the performance analysis results for each of the five performance factors as they relate to the Williams Gateway corridor. For each factor, additional information is provided about the methodology used to calculate the specific measures, and performance results are presented.

The system performance results were one piece of information among several used to evaluate the corridor concepts. This information should be evaluated in context with the analysis of demand above and feasibility below. In addition, the cost effectiveness of each option will need to be considered. For example, if a one concept provides a 10 percent improvement and a second concept provides 12 percent improvement, but costs twice as much, the former can be considered to be more cost effective.

Mobility

Three measures were used to estimate mobility:

1. **Vehicle miles of travel (VMT)** provide a system-level estimate of total travel on the system.

2. **Vehicle hours of travel (VHT)** provide a system-level estimate of the total time spent traveling on the roadway network.

3. **Percent of miles in congested condition** provides an assessment of the level of congestion experienced on the roadway network. This measure is captured at two levels. The first level is the percent of highway miles that have a volume-to-capacity ratio of more than 1 (indicating that the number of vehicles attempting to use the road exceeds the capacity). The second level is the percent of highway miles that have a volume-to-capacity ratio of more than 1.5. This latter condition can be thought of as roads that are highly congested.

Each of the concepts provides substantial benefits to the Apache Junction/Mesa subarea (Table 2.11). Nearly 30 percent of roadway miles are congested in the Base Future. The three concepts that include new corridors reduce this to between 6 and 9 percent. These corridors also reduce roadways that are very congested (50 percent more traffic than capacity) to well under 1 percent of total roadway miles.

Table 2.11 Mobility Performance Measures by Scenario

Apache Junction/Mesa Subarea

Alternative	Total VMT	VMT Deviation from Base	Total VHT	VHT Deviation from Base	Percent Network Congested	Percent Network Very Congested
Base Future	7,896,442		741,843		30.90%	2.80%
Enhanced Future	7,921,698	0.30%	463,605	-37.50%	18.90%	1.00%
Refined All Corridors	7,761,615	-1.70%	268,888	-63.80%	5.90%	0.10%
Corridor Concept	8,316,768	5.30%	325,732	-56.10%	9.00%	0.70%
Corridor Concept Plus	8,252,473	4.50%	308,496	-58.40%	7.40%	0.20%

These benefits can also be seen in the VMT and VHT in the study area. In particular, each of the corridor options reduces total hours of travel in the system in Apache Junction/Mesa subarea by between 55 and 65 percent.

Overall, each of the corridor options provides relatively similar mobility benefits, though the Refined All Corridors provides slight improvements over the other two.

Safety

Safety is measured using the crash rate by type of crash (fatality, injury, and property damage). Crash rates are presented per million VMT. Table 2.12 presents the changes in

the crash rate for the scenarios compared to the Base Future. Again, each of the corridor options provides substantial safety benefits, ranging from just under 10 percent for the Corridor Concept to over 15 percent for the Refined All Corridors concept.

Table 2.12 Safety Performance Measures by Scenario
Apache Junction/Mesa Subarea

Scenario	Total Crashes (Deviation from Base)
Enhanced Future	0.90%
Refined All Corridors	-16.20%
Corridor Concept	-9.70%
Corridor Concept Plus	-10.40%

Accessibility

Accessibility was measured using changes in access to major activity centers throughout the study area. Four major activity centers were identified, including one near the Williams Gateway airport and surrounding commercial area. Access was identified for these major activity centers using two methods:

1. **Color gradient maps** are used to present a geographic representation of the travel time to reach the specific activity centers identified above. These illustrate the amount of time it takes to travel to a zone containing a key activity center, using 15-minute increment bands.

2. **Trips within travel time bands** are also presented for each activity center to understand what percent of total traffic can access each activity center within the travel time bands. The travel time for each trip to the activity center zone is calculated based on the predicted volumes on roadways in the study area and partitioned into the travel time bands. Total trips are presented for zones within a band and the activity center.

Figure 2.13 presents the 30-minute bands for the Williams Gateway activity center for three key scenarios: Base Future, Refined All Corridors, and Corridor Concept. Table 2.13 presents the percent of trips within 30 minutes for each of the scenarios.

Each of the corridor-based scenarios provides substantial improvements in accessibility to the Williams Gateway activity center. These scenarios increase the number of trips that are within 30 and 45 minutes by 20 to 35 percent. The Refined All Corridors concept provides the greatest benefits, especially within the 15-minute band, which increases from 30 to 47 percent of all trips.

Figure 2.13 30-Minute Accessibility Bands by Scenario
Williams Gateway Activity Center

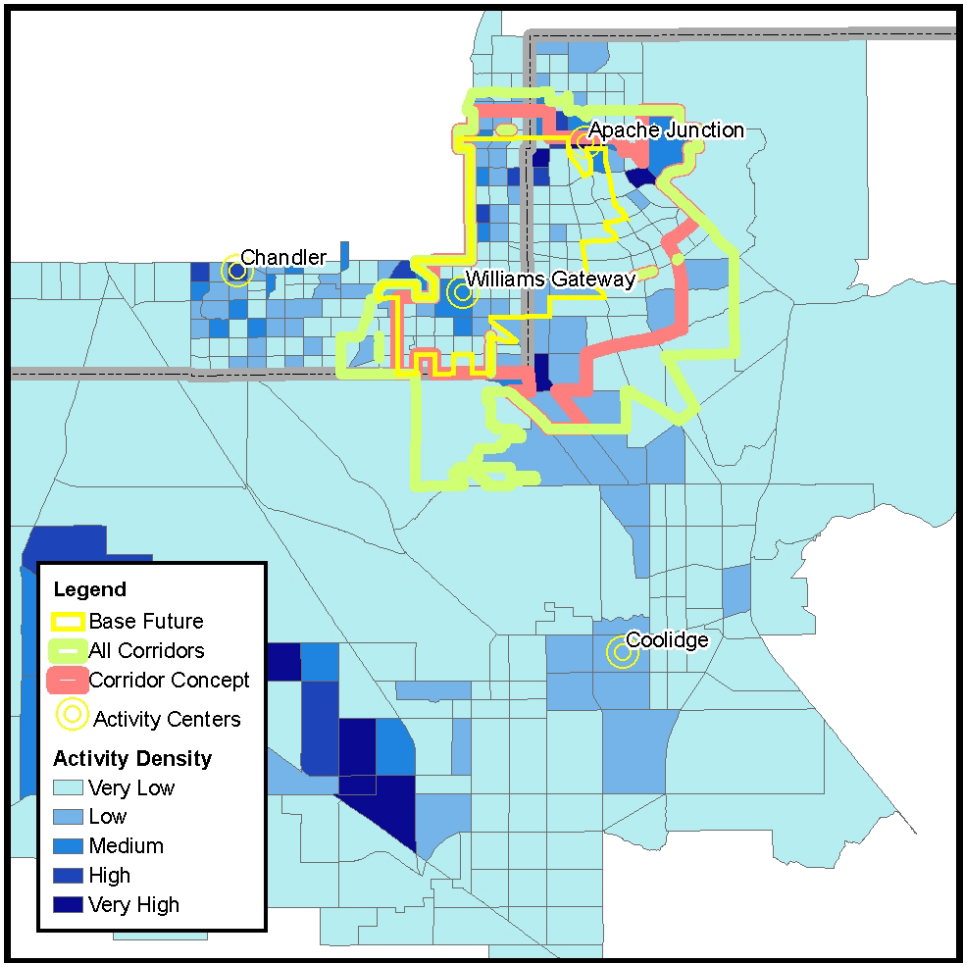


Table 2.13 Travel Time Band Breakdown by Scenario
Williams Gateway Activity Center

	Percent of Trips Within Each Band (Cumulative %)		
	15 Minutes	**30 Minutes**	**45 Minutes**
Base Future	28%	38%	61%
Enhanced Future	29%	53%	66%
Refined All Corridors	47%	73%	87%
Corridor Concept	30%	57%	71%
Corridor Concept Plus	31%	63%	71%

Resource Conservation

Resource conservation was evaluated using measures of fuel consumption and vehicle emissions. These two measures capture two aspects of resource usage that vary with levels of congestion and speed on the roadway network. Table 2.14 presents the resource conservation findings for the Apache Junction/Mesa subarea. All of the concepts provide substantial reductions in both fuel consumption and emissions, as compared to the Base Future.

Table 2.14 Resource Conservation Performance Measures
Apache Junction/Mesa Subarea

	Fuel Consumption	Emissions
Enhanced Future	-17.9%	-15.5%
Refined All Corridors	-27.9%	-27.0%
Corridor Concept	-21.9%	-20.5%
Corridor Concept Plus	-22.3%	-21.1%

Environmental Justice

Environmental justice (EJ) reflects a combination of resource conservation and accessibility concerns. For the corridor definition studies, EJ was evaluated using the concentration of three key population groups within the study area: minorities, elderly, and impoverished.

Much of the WGCDS study area is covered by undeveloped State Trust Lands. Although these lands are likely to have substantial development by 2030, it is difficult to accurately predict the characteristics of the future population in this area. The Apache Junction/ Mesa subarea does include a concentration of elderly residents who may face mobility issues. The Williams Gateway corridor is unlikely to substantially impact these residents or resolve the issues they face. Additional public transit, especially on-demand transit, may be needed in this area to provide fundamental mobility for these residents.

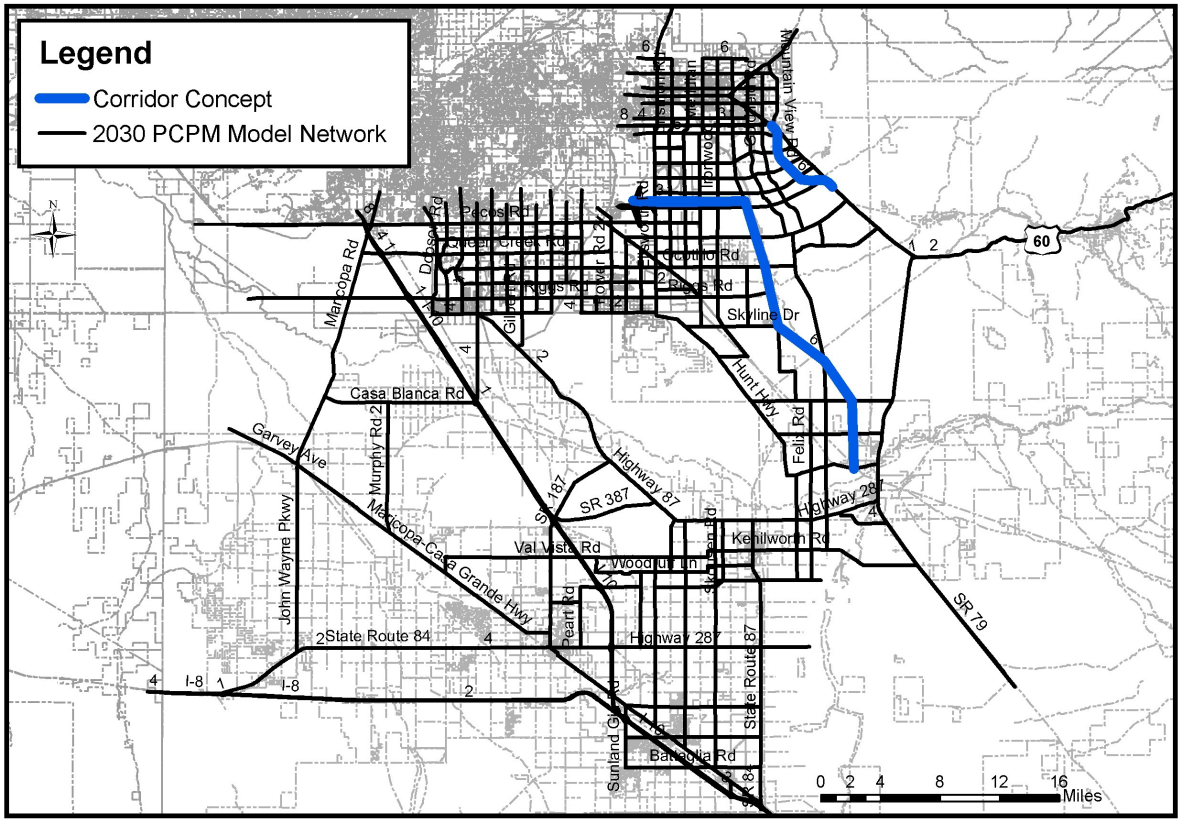
2.4 Corridor Concept

Based on the needs analysis described above, the Corridor Concept was identified as the set of new investments that should be considered for future needs. This section presents

the overall Corridor Concept, not just the portion within the WGCDS study area. Figure 2.14 presents the components of the Corridor Concept, which include:

- A six-lane Williams Gateway freeway starting at Loop 202 and connecting east to the North-South corridor;
- A six-lane north-south freeway from the Williams Gateway freeway that connects to either SR 79 or SR 287 in the Florence-Coolidge area; and
- A reroute of the existing U.S. 60 corridor in the vicinity of Gold Canyon.

Figure 2.14 Corridor Concept



As a result of the needs analysis, No Need was established for some corridor segments identified in the SEMNPTS. Some of the key observations from the SEMNPTS include:

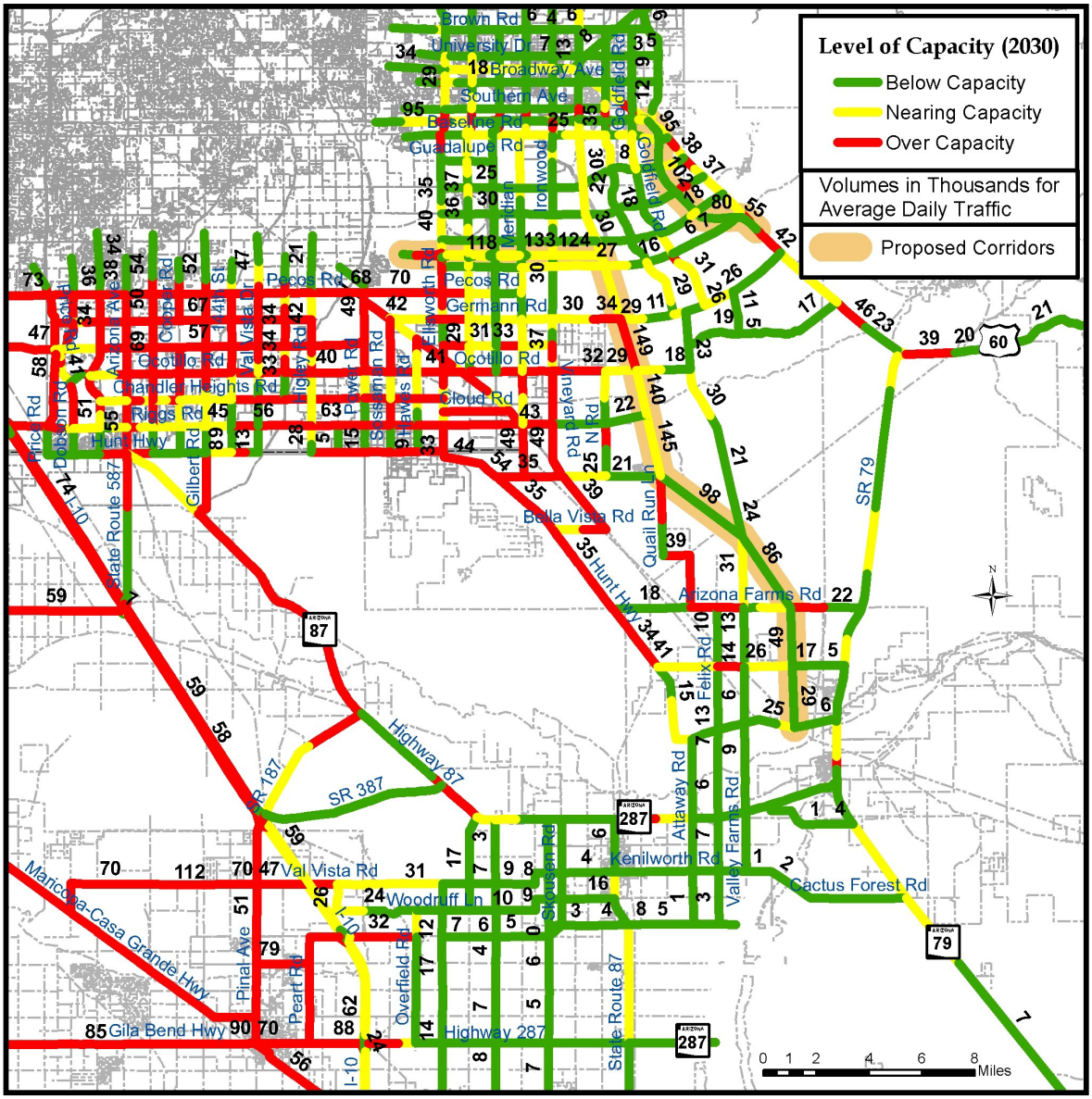
- No Need was established for the Williams Gateway corridor east of the North-South corridor. The corridor does not load significant traffic volumes or provide congestion relief on the arterial system.

- No Need was demonstrated for the east-west (Hunt Highway) corridor east or west of the Town of Queen Creek. The absence of a mature arterial network in Chandler, Gilbert, and Queen Creek amplifies congestion that is not resolved by an east-west corridor.

- No Need was established for a north-south freeway north of the Williams Gateway corridor. Traffic on this segment of the corridor is significant, however, and a new local arterial or parkway will likely be needed to help complete the street grid in this area.

A complete assessment of the traffic volumes and level of capacity for the entire study area is provided in Figure 2.15. The proposed corridors provide substantial relief to congestion throughout the study area. Some areas of congestion remain, particularly in and around Chandler, Gilbert, and Queen Creek; along I-10 and SR 87 in the Gila River Indian Community, and along some stretches of Hunt Highway between Queen Creek and Coolidge. Compared to the Base Future, however, most of these areas of congestion are substantially improved by the proposed corridors. Within Chandler, Gilbert, and Queen Creek, there remain unresolved issues with the arterial system. There are numerous gaps in the arterial system and many of the existing arterials (both north-south and east-west) are four lanes. Future studies in these areas will help determine the local investments needed to create a mature arterial system in these areas.

Figure 2.15 Corridor Concept Plus Future Volumes and Level of Capacity
Joint Study Area



3.0 Feasibility Analysis

3.0 Feasibility Analysis

This section analyzes the feasibility of a new Williams Gateway corridor. It provides an evaluation of corridor feasibility in the entire study area, not just the portion of the corridor that was identified as part of the needs analysis described above. As such, it provides useful information for the consideration of future feasibility of all transportation investments in this study area.

3.1 Methodology

The intent of the feasibility analysis is to identify major potential obstacles to the development of a new transportation corridor in the study area. This analysis is intended to provide a general assessment of feasibility, and not a specific analysis of potential alternate corridor alignments. The basic topics reviewed in the feasibility analysis include:

- **Engineering feasibility**. From an engineering perspective, flood retarding structures, the Central Arizona Project (CAP) Canal, and other features were evaluated for their potential to serve as barriers to roadway development.

- **Environmental feasibility**. Environmental experts, databases, and other sources were consulted to evaluate potential impacts with respect to rare and protected species, cultural resources, hazardous materials, noise sensitivity, and flood zones.

- **Land use issues**. The study area for the WGCDS covers a large portion of State Trust Land that is currently undeveloped. The Arizona State Lands Department (ASLD) is developing plans for this area that could lead to substantial development in the future. Additional land impacts were evaluated based on review of land use plans and current land uses.

- **Implementation**. Implementation of the corridor will require additional studies and funds. This section identifies the cost of a new Williams Gateway corridor, an analysis of the jurisdictional responsibility for this corridor, and an identification of the appropriate next steps required for implementation of the proposed corridor.

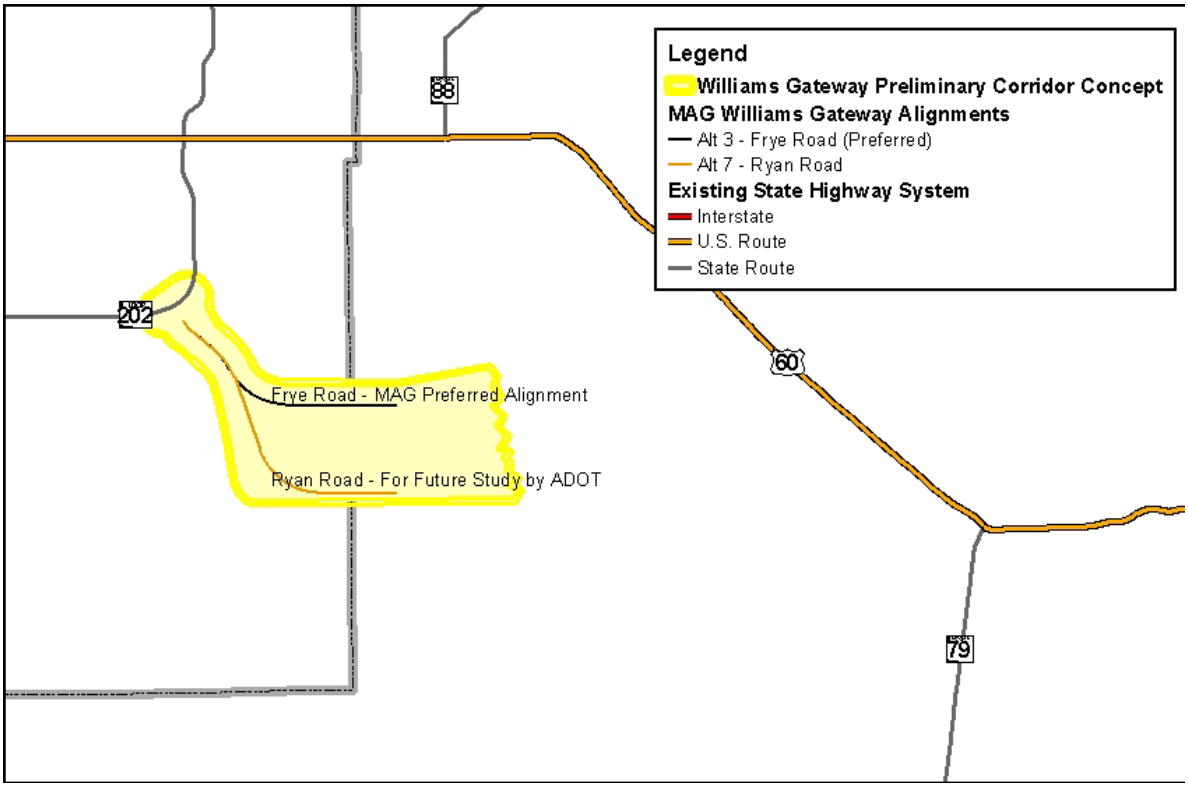
Alignments

In parallel with the ADOT study, MAG has been conducting an Alignment and Environmental Overview study for the portion of the Williams Gateway corridor within

Maricopa County. This corridor was identified as part of the voter approved MAG RTP, and is expected to be funded between 2016 and 2020. The recommended MAG alternative is described here.

The MAG Alignment and Environmental Overview study examined a range of alternatives for the location of the corridor in Maricopa County. Figure 3.1 presents the top three alternatives identified by MAG as part of the study out of seven alternatives initially considered. On July 27, 2005, the MAG Regional Council adopted Alternative 3 (along Frye Road) as the preferred alternative, based on the analysis conducted as part of the MAG study. The recommended alignment crosses the southwest corner of the General Motors (GM) Proving Grounds, which is currently in operation, but may cease operation by the time the road is developed. Alternative 3 does retain both test tracks used by GM, allowing for continued operation even with a future corridor. The MAG Regional Council also requested that Alternative 7 (along Ryan Road) be considered in the design concept/environmental evaluation to be conducted by ADOT.

Figure 3.1 MAG Williams Gateway Alignment and Environmental Overview Study – Recommended Corridor Alignments



Source: Cambridge Systematics, Inc., 2005; and Maricopa Association of Governments, 2005.

In Pinal County, several possible alignments were considered, extending east from the two alignments identified by the MAG study. This significantly narrows the band of alternatives originally considered by the WGCDS. Final general locations include:

- A Williams Gateway corridor that turns connects with the North-South corridor, heading southeast along the CAP Canal and connecting to SR 79 or SR 287 in the vicinity of Florence and Coolidge;
- A Williams Gateway corridor that crosses the CAP Canal, and connects east to U.S. 60, including a system-to-system interchange with the North-South corridor.

The feasibility analysis considers general engineering, environmental, and land use issues

3.2 Engineering Feasibility

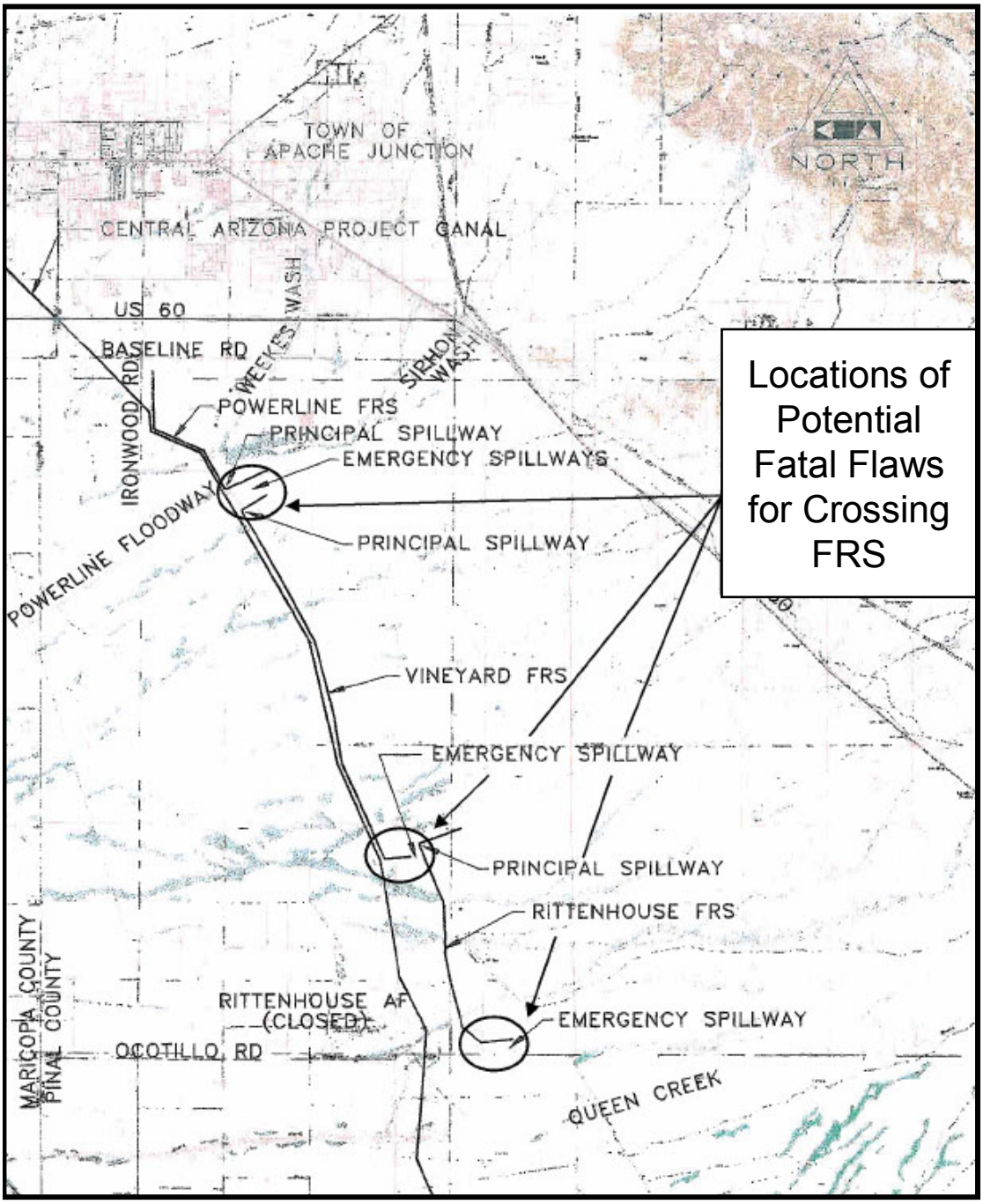
The review of engineering fatal flaws for the ADOT Williams Gateway Corridor Definition study generally covered the area bounded by Elliot Road on the north, Sossaman Road on the west, U.S. 60 on the east, and Queen Creek Road on the south. This study area contains many unique features including the GM Proving Grounds; the Williams Gateway Airport; the CAP Canal; the Powerline, Vineyard, and Rittenhouse Flood Retarding Structures (FRS); the Powerline Floodway; the Rittenhouse Auxiliary Airfield; and existing residential, industrial, and agricultural land uses. The following issues were identified as the most applicable to this study effort:

- Impacts to Flood Retarding Structures;
- Impacts to CAP Canal;
- Potential subsidence areas;
- Potential alluvial fan areas; and
- System-to-system interchanges.

Vineyard Flood Retarding Structure

A prominent storm water facility that traverses the Williams Gateway corridor is the Vineyard FRS. The Vineyard FRS is one in a series of three structures that protect the CAP Canal from flooding. Three structures – the other two being the Powerline FRS and the Rittenhouse FRS – run parallel to and east of the CAP Canal. The Vineyard FRS extends from approximately Elliot Road to Germann Road, the north and south boundaries of the WGCDS study area. The structures and adjoining facilities are shown in Figure 3.2.

Figure 3.2 FRS Facility Map



Source: Structures Assessment Program – Phase I, Alternative Analysis Report, FCDMC.

Generally, the flood retarding structures are interconnected and designed to retain, detain, and convey, through interconnecting facilities between them, the 100-year storm from the contributing watersheds. Spillways are used to connect the structures and are intended to convey flood flows in excess of the 100-year storm event, such as the standard project flood (or a portion thereof).

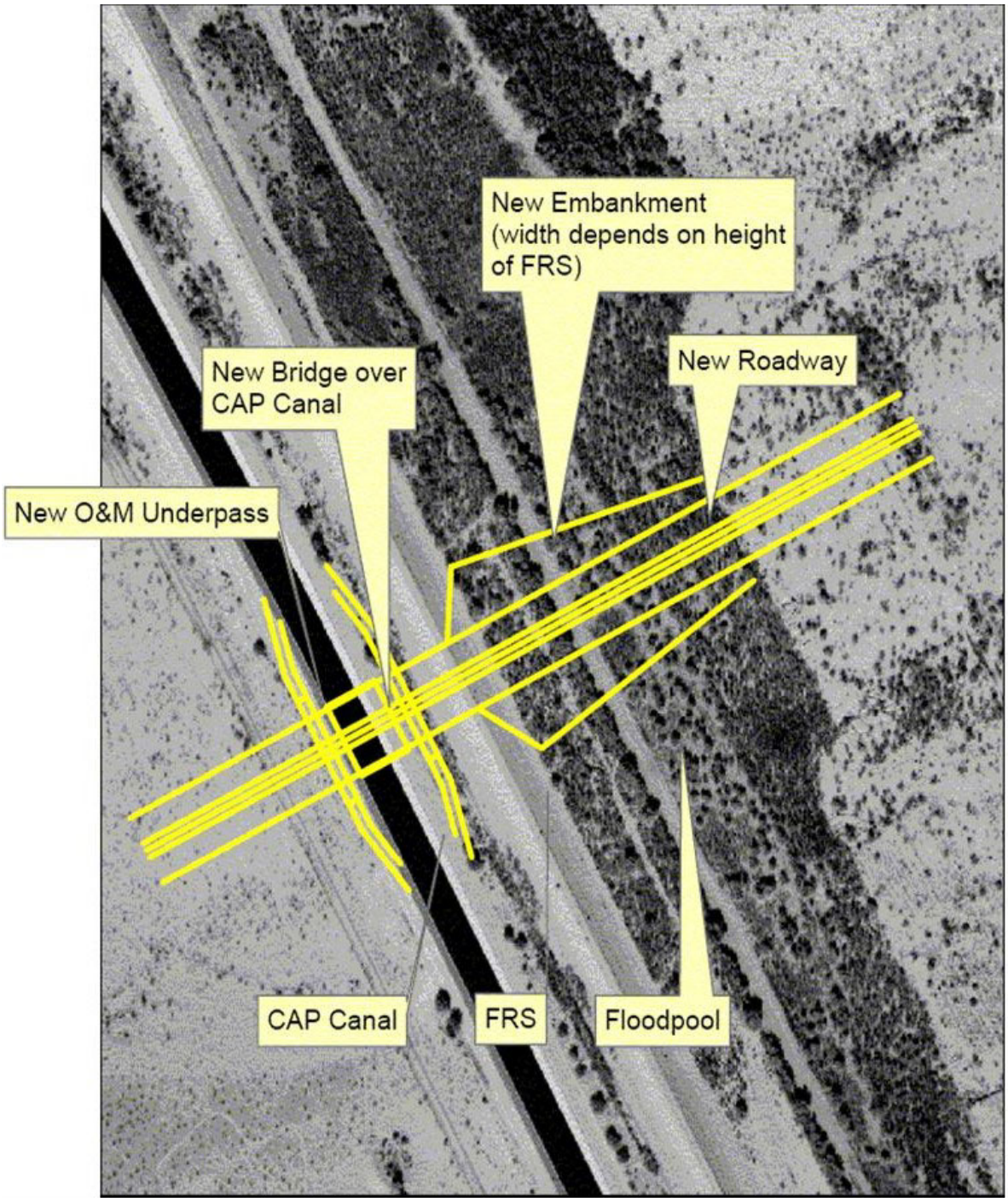
The Vineyard FRS principal spillway discharges into the Powerline Floodway, which is located at the north end of the Vineyard FRS. The Powerline Floodway passes over the CAP Canal through an overchute and continues southwest. The Vineyard FRS also has an emergency spillway located at each end of the FRS, one near Elliot Road and the other near Pecos Road.

The Vineyard FRS is an earthen dam that was originally constructed by the Soil Conservation Service – now the Natural Resource Conservation Service (NRCS) – in the late 1960s. All of the structures are under the jurisdiction of the Arizona Department of Water Resources (ADWR). According to the Maricopa County Flood Control District (MCFCD), the embankment structures, spillways, and floodpools are contained within a lease granted to MCFCD by the State Land Department. This lease covers approximately 30 square miles (19,000 acres). There is currently an outstanding lawsuit between the State Lands Department and MCFCD regarding the easement for these structures. In addition, the State Lands Department is currently examining the feasibility of reconstructing the floodpool impoundment area, replacing the existing earthen dams and floodpools to reduce the total land area used by the structures. Ideally, the State Lands Department would like to increase the depth of the floodpools and reduce the amount of surface area that is covered. This will allow State Lands Department to maximize the amount of state lands in this area that are available for development.

Although not recommended by this study, it is feasible for a new roadway to cross the FRS. A new crossing would need to be perpendicular to the FRS and would not impact the operation of the spillways. In order to avoid impact to the spillways, a new crossing would need to be located so that the footprint of the new crossing and embankments do not encroach into the existing spillway. The main floodpool/conveyance area would require culverts that allow flood flows to pass beneath (or equalize from side to side) the roadway crossing, and not inhibit the function of the FRS. The volume of the roadway embankment placed within the floodpool would need to be mitigated to preserve the current flood storage volume. A conceptual crossing of the FRS and CAP Canal is shown in Figure 3.3.

A new transportation corridor should not be planned immediately upstream (east) of the flood retarding structures within the floodpool. Attempting to parallel the FRS to the east would face physical constraints that are not conducive to a roadway facility. In addition, such an attempt would require extensive multiagency coordination, and would most likely result in extensive reconstruction of the floodpool impoundment area. Crossing the FRS with a roadway facility, or placing a roadway facility downstream of the FRS, is much more feasible.

Figure 3.3 FRS/CAP Crossing Schematic



Note: This graphic depicts a generic conceptual FRS/CAP crossing and is not intended to represent a specific location.

Modifications to the FRS will require coordination with ADWR, NRCS, and MCFCD. ADWR is the state regulatory agency responsible for dam safety. An ADWR permit is required prior to modifying any jurisdictional FRS or dam in Arizona. The MCFCD currently owns and operates the FRS. The NRCS is the Federal agency that originally designed and constructed the FRS, and has approval authority for any modifications to the structure. These public agencies have detailed design criteria, operations and maintenance (O&M) requirements, and regulatory permitting requirements for modifying the FRS structure and flood impoundment reservoir.

Central Arizona Project Canal

The CAP Canal traverses the Williams Gateway corridor roughly two miles east of Ironwood Road. A new roadway crossing of the CAP Canal is feasible. Although not recommended by this study, a new crossing would preferably be perpendicular to the canal, and would not impact the existing overchute pipes of the Powerline spillway. In addition, a new crossing should not impact the continuity of the O&M roads on each side of the canal. The most feasible crossing would include a new structure over the CAP Canal. The O&M roads could cross through a span of the new structure, or through oversized concrete box culverts beneath the new roadway (adjacent to the structure).

Crossings of the CAP Canal will require coordination with the U.S. Bureau of Reclamation and the Central Arizona Water Conservation District. The Bureau of Reclamation is the Federal agency that originally constructed the CAP Canal and owns the facility. The Water Conservation District is the local agency responsible for operating and maintaining the canal. These public agencies have detailed design criteria, O&M requirements, and permitting requirements for any improvements crossing the CAP Canal right-of-way.

Subsidence Areas

Land subsidence is a substantial concern in areas that have made substantial use of the groundwater in the area. The following documents were reviewed with respect to land subsidence and developed earth fissures in the vicinity of the Williams Gateway corridor:

1. *Land Subsidence, Earth Fissures, and Water Level Change in Southern Arizona by the Arizona Bureau of Geology and Mineral Technology*, 1986; and

2. *Structures Assessment Program Phase I Final Failure Mode Analysis Report*, Flood Control District of Maricopa County, 2002.

In general, the entire area has undergone subsidence over the past several years due to groundwater withdrawal. In itself, that does not pose a problem with respect to either roads or structures as the entire area has settled, and differential movements are negligible.

Earth fissures have been mapped within the area bounded by Elliot Road, U.S. 60, Meridian Road, and Ironwood Drive. Numerous fissures have also been mapped to the south of Germann Road near the flanks of the Santan Mountains. No fissures were noted as being in the vicinity of the Vineyard FRS, which runs parallel with and just upstream of the CAP Canal extending from Elliot Road, south to near Germann Road. New fissures have typically not been developing as groundwater withdrawals in this general area have slowed due to decreases in the need for irrigation water.

Final assessment of fissures and subsidence will require more detailed study. Although fissures can cause serious problems with the development of a roadway, it is feasible to construct over or around fissures with appropriate engineering methods.

Alluvial Fans

An alluvial fan is a fan-shaped deposit where a fast-flowing stream flattens, slows, and spreads, typically at the exit of a canyon onto a flatter plain. Due to the slowing of flow, any solid material carried by the water is dropped. As this reduces the capacity of the channel, the channel will change directions over time, gradually building up a slightly mounded or shallow fan shape. Multiple braided streams are usually present and active during water flows. Alluvial fans are most likely to be found in desert areas subject to periodic flash floods from nearby thunderstorms in local hills. Alluvial fans are common around the margins of the sedimentary basins of the Basin and Range province of the southwestern United States and northern Mexico, including the area of State Trust Lands to the east of the CAP Canal.

Generally, the main design considerations for transportation facilities that cross alluvial hazard areas are to design for potential horizontal migration of flow, provide for relatively high sediment loading, and accommodate runoff in a fashion that does not cause diversion of flow toward presently designated low or no hazard areas. Some redundancy in drainage crossing facilities may be necessary in order to provide for a potential variability of flow locations.

System-to-System Interchanges

The Williams Gateway corridor has potential connections to several existing highway systems in the area. The western terminus is at the Santan Freeway (Loop 202) in Maricopa County. A recommended location for this interchange near Hawes Road has been identified in both the RTP and the Williams Gateway Alignment and Environmental Overview study for the MAG. This will be half of a system interchange, because it serves as the terminus for the Williams Gateway corridor. This interchange will also accommodate access to the Santan Freeway at Hawes and to the new Williams Gateway Airport terminal.

A second potential interchange would be with the North-South corridor in the vicinity of the CAP Canal. If the Williams Gateway corridor turns south at the CAP Canal, con-

necting to the North-South corridor, no additional system-to-system interchanges will be needed. However, access may need to be provided to a potential local parkway connecting from Apache Junction to the north-south/Williams Gateway corridor.

If the Williams Gateway corridor continues east over the CAP Canal, a system-to-system interchange will need to be developed at the junction of the Williams Gateway and North-South corridors. This interchange may also be only a half interchange, if the north-south terminates at Williams Gateway. However, a new local parkway from Apache Junction may increase the complexity of this interchange.

If the Williams Gateway corridor continues east to U.S. 60, a system interchange may be needed where these roads intersect. Some of the issues that need to be addressed by this interchange include:

- The tie-in of the proposed U.S. 60 reroute into the existing U.S. 60. If the Williams Gateway corridor connects to U.S. 60, it may be useful to tie in at the same location, connecting all of the new infrastructure needed for these facilities.

- The Renaissance Festival may present a constraint on both the tie-in of the U.S. 60 reroute and any potential connection of the Williams Gateway corridor. The U.S. 60 Corridor Definition Study has identified a connection to the existing U.S. 60 southeast of the site.

- The type of facility constructed. If the Williams Gateway corridor were constructed as a freeway east of the CAP Canal, it will require a system-to-system interchange. If it is constructed as an expressway or arterial, a stoplight controlled intersection or traditional interchange on U.S. 60 may be sufficient. System-to-system interchanges are more expensive, but allow for easier movement of vehicles between facilities.

Further study and refinement will be necessary to identify the preferred solution for the tie-in of the Williams Gateway freeway corridor and the U.S. 60 corridor.

Summary

In summary, the most critical issue identified is the interface with the flood retarding structures. Crossing the FRS and CAP Canal is feasible, except near the floodways, as shown in Figure 3.3. However, a new transportation corridor should not be planned immediately upstream of the FRS within the floodpool, as it is currently designed. Future studies will be needed to determine all of the relevant engineering issues and to determine the location of major system-to-system interchanges.

3.3 Environmental Feasibility

This section reviews key environmental considerations in the Williams Gateway study area, including the following:

- Protected habitats;
- Cultural and historical resources;
- Noise sensitive areas; and
- Hazardous materials sites.

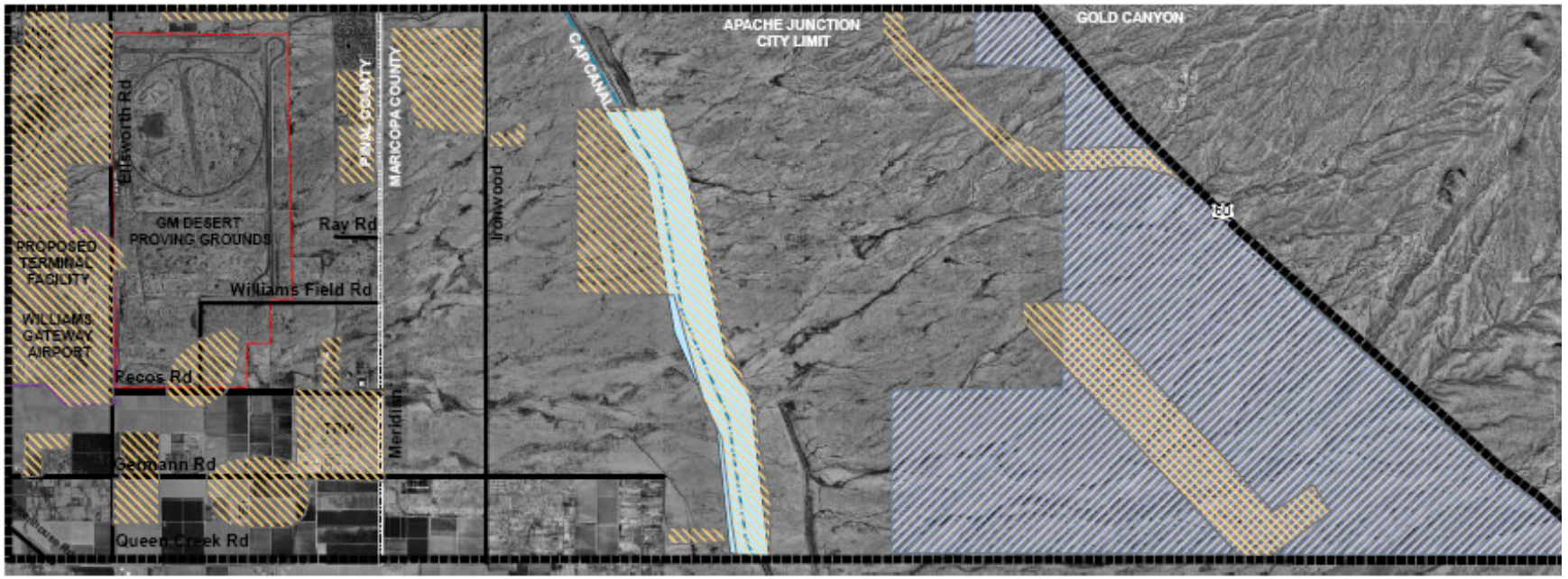
These key environmental issues have been organized around consideration of two key themes: resources and constraints.

Resources

Protected Habitats

As shown in Figure 3.4, the area of natural resource zoning is along the CAP Canal. The U.S. Fish and Wildlife Service (USFWS) list of threatened, endangered, proposed, and candidate species for Maricopa and Pinal Counties was reviewed by a qualified biologist. Potential impacts to known populations or potentially suitable habitat were assessed. Three species, the Cactus Ferruginous Pygmy Owl, the Lesser Long-Nosed Bat, and the Acuna Cactus (mostly outside the Maricopa County segment), could potentially be present. In response to a letter of inquiry, the Arizona Game and Fish Department (AGFD) indicated that the Western Burrowing Owl (an Endangered Species Act Species of Concern and a U.S. Bureau of Land Management (BLM) Sensitive species), and the Pocketed Free-Tailed Bat (a BLM Sensitive species) have been documented as occurring in the project vicinity. AGFD also stated that this project does not occur in the vicinity of any Proposed or Designated Critical Habitats. When a roadway alignment is determined and National Environmental Policy Act (NEPA) documentation is started, further coordination with AGFD will be required.

Figure 3.4 Study Area Resources



Legend

- Study Area Boundary
- Areas of Previous Historic or Archaeological Surveys
- Natural Resource Zoning
- Desert Wells Multi-Use Area
- Proposed CAP Canal Trail

0 1 2 Miles

N W E S

Cultural (Archaeological and Historic) Resources

A review of the Arizona State Museum database was conducted for the study area to obtain surveys and recorded site locations. Areas previously surveyed within the present study area are shown in Figure 3.5. Disclosure of site locations is prohibited by law. Consultation with the Arizona State Historic Preservation Office (SHPO) regarding these surveys, the survey results, the exact locations of recorded historic or archaeological sites, and survey recommendations must be undertaken if any alignment approaching these survey areas is considered. Additional surveys may be required.

A letter was sent to the SHPO requesting information regarding any archaeological sites, historic sites or properties, and other environmental concerns that may exist in the Pinal County portion of the project area; specifically, east of Tomahawk Road within Arizona State Trust Lands. No response has been received from SHPO.

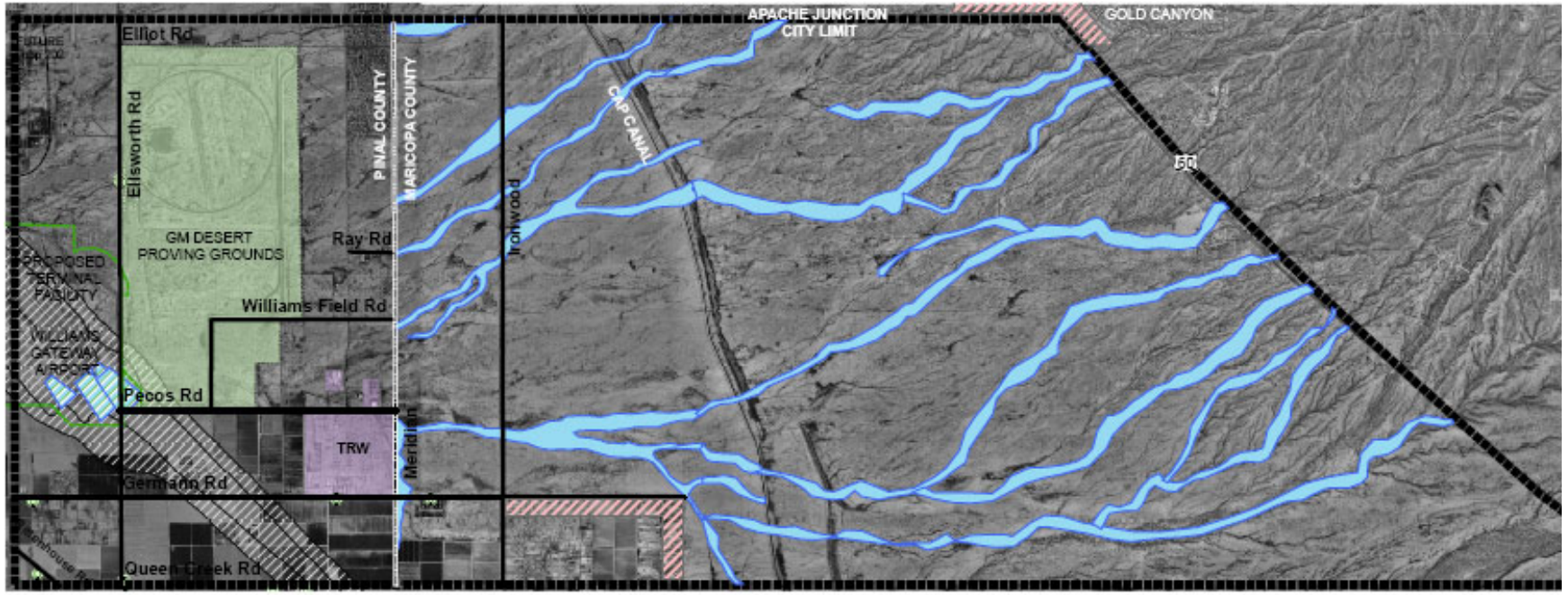
Constraints

Some of the most significant constraints in the study area are the Williams Gateway Airport and its associated noise contours at the western edge of the study area, the large GM Proving Ground site just to the east of the airport, the TRW industrial facility to the southeast of the Proving Grounds, and the floodplains to the east of the Maricopa County/Pinal County border.

Noise-Sensitive Areas

Noise contours exist around the Williams Gateway Airport and to the southeast of the airport. A qualitative assessment of corridor centerline within 0.25 mile of any existing residences or other sensitive receivers was reviewed from aerial photography and a site reconnaissance. Where the northern boundary of the study area (Elliot Road) intersects U.S. 60 in Gold Canyon, a development extends approximately three-fourths mile west of U.S. 60, and is less than one-fourth mile north of the study area boundary. Other neighborhoods are located along the southwest edge of the study area (Germann Road) from Ironwood Road (Vineyard Road) to Tomahawk Road, and then south along Tomahawk Road to Queen Creek Road. If an alignment is considered near one of these areas (shown in Figure 3.5), noise analyses should be undertaken.

Figure 3.5 Study Area Constraints



Hazardous Materials Sites

A review of Arizona Department of Environmental Quality (ADEQ) and Federal Environmental Protection Agency (EPA) databases was completed to determine whether any potential disturbance to existing hazardous materials sites and/or monitoring wells would occur from any of the alternatives or more generally, within the Maricopa or Pinal County portions of the study area. The former Williams Air Force Base is listed as a Superfund Program Site in the Eastern Phoenix Area (July 2003) by the ADEQ. The ADEQ Underground Storage Tank (UST) database shows several USTs in the study area. Six USTs are located within Florence Junction easements owned by ADOT: one tank in the eastbound easement and five in the westbound easement. These tanks are listed as "temporarily closed." Further research regarding these tanks and their exact locations should be undertaken if any alignment approaching these sites is considered. The general locations of hazardous materials sites known at this time are shown in Figure 3.5.

Environmental Feasibility Summary

According to the AGFD, this project does not occur in the vicinity of any Proposed or Designated Critical Habitats. Several sites have previously been surveyed for cultural resources, but additional surveys may be required, particularly within the Arizona State Trust Lands. Noise sensitivity analyses may be required if the alignment passes near neighborhoods in the southwest edge of the study area. Several USTs are located in the study area, and further research would be required if the alignment were to approach one of these sites.

3.4 Land Use Issues

This section addresses land use issues, including the following:

- Existing developments;
- State Trust Lands;
- Parklands;
- Prime and unique farmlands; and
- Section 404 issues.

Existing Developments

This study area contains several special considerations that may affect feasibility. The GM Proving Grounds is a 5,000-acre parcel directly to the east of the airport. Recently sold to a private developer, GM is leasing the property back under a five-year lease. Other existing

developments include the TRW industrial facility, and existing residential neighborhoods located along the southwest edge of the study area (Germann Road) from Ironwood Road (Vineyard Road) to Tomahawk Road, and south along Tomahawk Road to Queen Creek Road.

MAG Regional Council has requested that ADOT include Alternative 7 (along Ryan Road) from the MAG Williams Gateway Alignment and Environmental Overview study in future environmental and alternatives analyses. This alternative would significantly impact the existing development between Germann and Queen Creek Roads east of Ironwood Road. It would require taking property and splitting an existing development in two.

State Trust Lands

A major feature of the study area is the large area of State Trust Lands to the east of the County border. The ALSD is currently conducting drainage and planning studies with the intention of selling these lands for development. The State Lands Department has identified two primary areas for development:

1. Lost Dutchman Heights consists of 12 square miles of State Trust Lands within the existing Apache Junction City limits (Elliot Road). This will be the first set of lands that will be sold off in this area.

2. Superstition Vistas is an even larger 275 square miles between Apache Junction and Queen Creek that is also slated for future development. Although more detailed study is needed for these areas, it is expected that development will begin before 2030, the horizon year for the WGCDS.

Although the State Trust Lands do not present a direct constraint to development, ADOT will have to continue working closely with the ASLD as the corridor concepts described above are refined. The ASLD is not obligated to sell land to ADOT; its mission is to provide the greatest return on its assets as a means to fund Arizona's public schools. The access provided by a new highway corridor in this area may provide additional value to the land, but final location of the corridor will need to be negotiated with the ASLD.

Parklands (Section 4(f))

A review of known or planned parks, recreation areas, waterfowl or wildlife refuges, or significant cultural resource sites known to be eligible or potentially eligible for listing on the National Register of Historic Places (NRHP) under Criterion A, B, or C was completed for the study area. No known impacts were documented for alternatives being considered.

A review of existing data sources was conducted for any known or currently planned parks, recreation areas, waterfowl or wildlife refuges, or significant cultural resource sites known to be eligible or potentially eligible for listing on the NRHP.

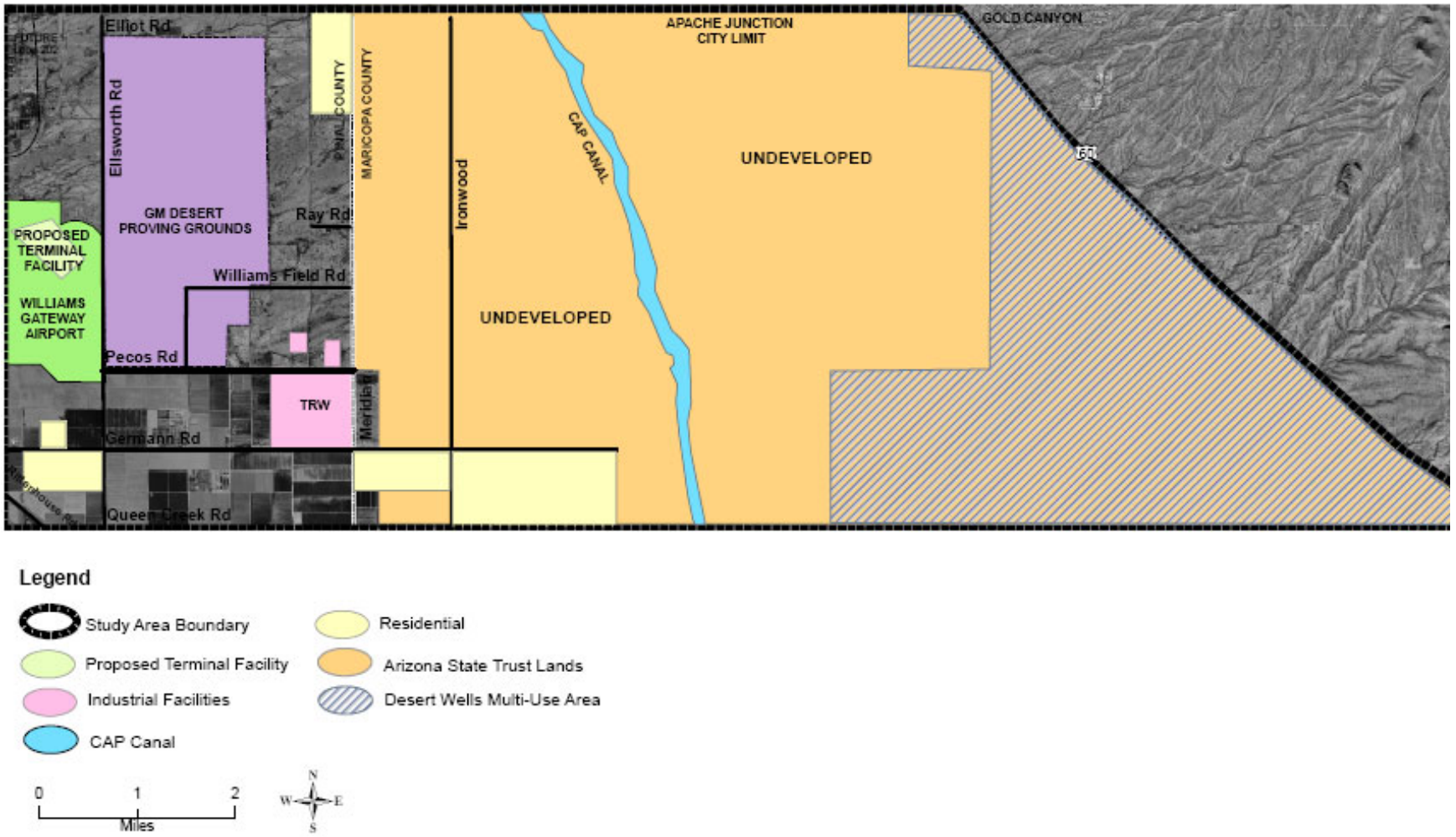
The Pinal County Trail Plan identifies a trail corridor along the CAP Canal; this is a "20-foot recreation corridor on the right side of the canal (facing downstream)." The Pinal County Comprehensive Plan Land Use Map shows the CAP Canal as a Natural Resource Area that "may include active and passive parks, river corridors, natural areas, livestock grazing, conservation leases, national forests, hunting and public recreation, and wilderness areas." To date, however, none of these uses has been established along the CAP Canal in this portion of Pinal County; therefore, current land uses would not be a barrier to construction.

Most of the land from the Maricopa County line east to U.S. 60 is State Trust Land; and much of this State Trust Land is part of the Desert Wells Multiuse Area, as shown in Figure 3.6. This area, south of U.S. 60 and west of SR 79, is part of a two-year commitment from several agencies, private ranchers, and off-highway vehicle (OHV) groups to develop the area for recreation and responsible OHV use. Horseback riders, hikers, and other outdoor enthusiasts also share use of this area. A recreational permit from the ASLD is required for access, and users must stay on existing roads and trails to protect wildlife habitat. As this area is developed, further study would be appropriate to determine the applicability of Section 4(f) to the proposed CAP Canal Natural Resource Area and multiuse area, shown in Figure 3.6. Although this study does not recommend development of a highway corridor east of the CAP Canal, other roadway developments (such as arterials) and residential development in this area will need to consider these issues in their environmental reviews.

Prime and Unique Farmlands

A review of existing land uses and zoning was completed to determine potential concerns under the Farmland Protection Policy Act (FPPA). All existing agricultural land is currently zoned for other land uses. No Prime Farmlands exist within the Maricopa County portion of the study area. The Pinal County Comprehensive Plan Land Use Map has designated the largest portion of land in the study area as Transitional, which are designated as rural in character, but with expectations for future growth. The far southwest corner of the study area is designated "Rural Community," a growth designation based on the availability of public services and infrastructure. Therefore, no impacts under the purview of the Act would occur as a result of roadway development.

Figure 3.6 Existing Land Uses



Section 404 Issues

A review of Federal Emergency Management Agency (FEMA) 100-year floodplain information, web-based mapping and previous drainage technical studies or reports, and wash crossings based on Geographic Information System (GIS) data was used to assess the number of FEMA floodplains or wash crossings within the Maricopa County and Pinal County segments of the study area. The floodplains and washes identified during this assessment are shown in Figure 3.6. Depending on the alignment selected, up to one 100-year floodplain and one Water of the United States might be impacted.

A letter was sent to the U.S. Army Corps of Engineers (USACE) requesting information regarding any Waters of the U.S. issues and any other environmental concerns that may exist in the Pinal County portion of the project area; specifically, east of Tomahawk Road within Arizona State Trust Lands. USACE reported that within a three-mile radius of the middle of the State Trust Land, Rittenhouse FRS has a nationwide 404 permit, and many housing developments have Jurisdictional Determinations (JD) and 404 permits. No individual permits were found. USACE recommends that any development within the study area consider Section 404 requirements and permits. Further research regarding existing JDs and their exact locations should be undertaken when an alignment is selected.

Land Use Feasibility Summary

No parklands exist in the study area that would serve as an obstacle to roadway construction. No impacts under the Farmland Protection Policy Act would occur as a result of roadway development. Further research regarding existing Jurisdictional Determinations and 404 permits should be undertaken when an alignment is determined.

3.5 Implementation

This section addresses costs, general financing, and timing of potential facility construction.

Cost

Much of the proposed facility identified by this study would be built through State Trust Lands that have never been developed. As such, there is limited existing information about the specific corridor that can be used to help develop cost estimates. Drainage studies being conducted by ASLD, as well as any potential future engineering and environmental studies conducted by ADOT, will be needed to finalize costs.

Table 3.1 presents a rough estimate of the cost of a new freeway using information from recently constructed freeways in the Phoenix metro area. Costs are provided by component.

Table 3.1 New Facility Cost by Component

Item	Unit	Cost (2005$)
Roadway (pavement- & roadway-related items)	Lane-mile	$2.5 million
Traffic interchanges @ crossroads	Each	$8 million
System-to-system interchanges	Each	$50 million-$150 million
Structures (over canals, washes, creeks)	Square foot	$80
Right-of-way	Acre	$80,000 to $240,000
Drainage (on-site roadway drainage system)	Mile	$750,000

Note: Costs are in 2005 dollars. Cost of structure at interchange is included in interchange unit cost. Freeway costs based on recent ADOT experience on Red Mountain and Santan Freeway costs in Mesa.

Right-of-way costs are the most variable component of the overall cost estimates. The cost estimates assume that 350 feet of right-of-way are required, or a total of 43 acres per mile. Because much of the land is State Trust Lands, ADOT will have to negotiate with ASLD to determine the price for the land. Recent State Trust Land auctions have averaged around $180,000 per acre and as high as $240,000 an acre. ADOT does not participate in the public auction process and has paid about $80,000 an acre for State Trust Land on other recent projects. However, given increase land values, the right-of-way in this area will likely be towards the upper range.

All told, a new freeway-type facility in the Williams Gateway corridor will cost between $35 million and $45 million per mile. As noted previously, the segment of the Williams Gateway freeway within Maricopa County is funded through a one-half-cent sales tax approved by County voters in 2004. The Pinal County portion, which remains unfunded, is just over two miles of roadway. The total cost for this stretch will be between $75 million and $100 million.

Connection to U.S. 60

If the Williams Gateway corridor were developed east to U.S. 60, several additional costs would need to be considered, including a crossing of the CAP Canal and flood retarding structures, a system interchange with the North-South corridor, and a system interchange with U.S. 60.

Canal crossing. A crossing of the CAP Canal (not considering an interchange with the North-South Corridor) would consist of four elements:

1. An elevated roadway to pass over the CAP Canal and the FRS;

2. A bridge over the CAP Canal with associated O&M underpasses for the CAP Canal crews;

3. An embankment placed on and near the FRS and within the floodpool in order to elevate the roadway to pass over the FRS (see #1 above); and

4. Related excavation within the floodpool to offset the additional material placed within the floodpool in order to maintain the existing water storage volume.

This type of crossing was shown schematically in Figure 3.3. A primary component of such a crossing is the related earthwork to elevate the roadway to cross both the CAP Canal and the FRS on a single bridge. This approach has been used in two locations recently:

1. The SR 51/Loop 101 traffic interchange in north Phoenix; and

2. The Red Mountain freeway (Loop 202) between Power Road and Brown Road in east Mesa.

The worst-case (most expensive) scenario would include a bridge that spanned the floodpool, instead of placing the new roadway on dirt as discussed above. Assuming that the floodpool is 1,000 feet wide, a new bridge for a typical ADOT freeway would cost between $12 million and $14 million in the worst-case scenario. This is similar to the cost of building a new interchange. If the crossing were placed on an embankment, however, the costs would be much lower. All of these costs are dependent on the specific location of the roadway. As described above, a road crossing over one of the floodways between the flood retarding structures would face substantial engineering constraints.

System-to-system interchanges. As noted in Table 3.1, system-to-system interchanges range from $50 million to $150 million, depending on the complexity. The additional system-to-system interchanges identified here may be somewhat less expensive, because one road terminates at each junction (i.e., the Williams Gateway might terminate and U.S. 60, and the north-south might terminate at the Williams Gateway). As a result, fewer ramps and connections are required. At a minimum, the two additional system-to-system interchanges required if the facility continues to the east will cost at least $100 million, and could cost up to $300 million.

Financing

Detailed information on financing new transportation corridors will be provided in the *Financing Strategies Technical Memorandum*. Several key financing sources may prove use-

ful for the new corridors recommended as part of the corridor definition studies, including:

- **State financing**. ADOT's Highway User Revenue Fund (HURF) provides funding for capital construction, maintenance, and operation of the state highway system. This funding is split between three areas of the State – Maricopa County (37 percent), Pima County (13 percent), and the 13 other counties (50 percent). Within the 13 other counties, much of this funding has been dedicated to preservation of the existing system. Activities such as pavement resurfacing, bridge rehabilitation, safety projects, and others have historically consumed about 70 percent of these funds. As Pinal County and other areas across the State develop into urban areas like Phoenix and Tucson, these formulas may shift. Until they do, the State will have limited resources to put towards major new roadways.

- **Local financing**. Pinal County also has a one-half-cent sales tax that is split between the cities (40 percent) and the County (60 percent). Currently, the County receives only about $3 million a year from this source, because of the small tax base in the County. However, with population expected to grow to over 1 million by 2030, this tax base may grow as well. The one-half-cent sales tax is on retail sales, requiring increased shopping and not just population. Maricopa County currently benefits as both a regional shopping destination and a national and international tourist destination.

- **Toll financing**. Another source of potential funding for new facilities may come from creative sources, such as toll roads. Assessing the financing possibility of a toll road will require a much more detailed study. One of the biggest challenges to this assessment is the lack of existing facilities in this area. Recent examples of toll road development in the U.S. have largely been to add toll roads to existing facilities. These facilities already show demand, making it easier to assess the potential diversion from the existing facility to a new toll road. Demand for the proposed facilities that are recommended by the corridor definition studies will necessarily take time to develop as the study area develops.

Implementation

Implementation of a future Williams Gateway corridor will require several additional steps. As described throughout this report, the following two different portions of the Williams Gateway corridor will be handled separately:

1. The portion of the corridor within Maricopa County is funded as part of the MAG RTP, and is scheduled for construction in Phase III of that process between 2016 and 2020. ADOT is the lead agency responsible for constructing and maintaining the freeway system in Maricopa County, though much of the funding comes from local sources, in particular the one-half-cent sale tax.

2. The portion of the corridor with Pinal County is as yet unfunded. Furthermore, the needs analysis has identified a single Williams Gateway to North-South corridor that will require further refinement for implementation.

The implementation steps for these two portions of the corridor will not be the same, but the two processes need to be closely coordinated to ensure that a single, continuous facility be constructed. Under the current funding, the Williams Gateway freeway will end at Meridian Road. Although it will provide improved access to Williams Gateway Airport and to future developments at the GM Proving Grounds, the long-term considerations will require further evaluation.

Within Maricopa County, the next steps for corridor development are already in place. ADOT has in place a procurement process for the Maricopa County regional freeway system. Several consultant firms will be conducting Draft Construction Reports (DCRs), and implementing the freeway system. For the Williams Gateway freeway, some of the initial environmental work has been conducted as part of the MAG Williams Gateway Alignment and Environmental Overview study. This information will be used for a DCR that determines a final alignment and develops phases for construction of the freeway.

Within Pinal County, several additional steps are needed to get to this point, including:

- State Transportation Board action on the draft corridor concept described in this working paper. Before additional studies can be conducted to determine potential alignments, the Arizona State Transportation Board must act on the recommendations of the corridor definition studies, including the Williams Gateway study. After reviewing the findings of these studies, the Board must choose whether or not to adopt the recommended corridors as state routes.

- Alignment studies for the proposed corridors. If the Board adopts the recommended corridors as state routes, they will be eligible for further study. These studies would address in detail potential alignments and engineering and environmental issues. This would lead to a DCR that identified a preferred alignment, costs, and phasing of construction.

- Identification of funding. Funding remains the most significant challenge to the development of these corridors. ADOT faces numerous needs across the State that include preserving and operating the existing infrastructure, and capital investments to expand the existing system. These capital investments include widening existing highways, new interchanges, and many other types of projects. The new corridors identified in this working paper would consume ADOT's entire budget for capital investments for several years. As a result, local and creative financing will almost undoubtedly be needed for actual implementation of these corridors.

4.0 Next Steps

4.0 Next Steps

This working paper provided an in-depth analysis of the need for and feasibility of a new corridor connecting Loop 202 in Maricopa County eastward to U.S. 60 in Pinal County. The working paper is one of several inputs into the overall planning process for the WGCDS.

4.1 Summary of Findings

The key findings from the needs analysis were as follows:

- A Williams Gateway/North-South corridor is needed in connecting Loop 202 in Pinal County, east to the CAP Canal, and then south to either SR 79 or SR 287 in the vicinity of Florence and Coolidge;
- A reroute of the existing U.S. 60 corridor in vicinity of the Gold Canyon is also needed; and
- The state highway system in Pinal County will need access management and some segments may require widening to accommodate future travel demand and the growth of the area.

The overall findings of the feasibility analysis suggest that a new Williams Gateway corridor is feasible. Existing developments in the area of need create some constraints on the precise alignment of this corridor. In particular, an alternative south of Germann Road would significantly impact an existing residential development.

Implementation of new corridors faces several constraints; the most significant of which is financing. Although the portion of the Williams Gateway corridor with Maricopa County has been funded, there are only limited funds available for any of the corridors recommended in Pinal County. Existing financing mechanisms at the state and local levels currently are not producing enough money to develop these corridors within the 25-year timeframe of this study. Creative financing may be required to help address these future needs.

4.2 Next Steps

The results of this working paper will serve as one of several inputs into the overall planning process. Other key inputs include:

- Public and stakeholder input gathered through two rounds of public involvement;
- More detailed estimates of potential financing mechanisms for new highways; and
- Additional studies and analysis related to future population growth in Pinal County.

This document is not intended to stand alone, but instead to provide technical analysis as one basis of study recommendations.